The REVIEW

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THE MONTHLY SURVEY AND DIGEST OF WHAT'S NEW IN METALS

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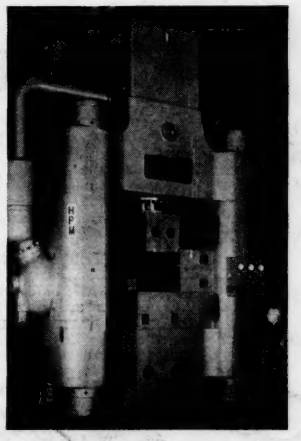
Huge Hydraulic Press For Metal Powders

One of the largest hydraulic presses ever built for powder metallurgy has been completed by the Hydraulic Press Manufacturing Co. of Mount Gilead, Ohio. The press is designed for briquetting powdered carbides of tungsten, titanium or tantulum for carbide cutting tools, dies and inspection gages, but is also suited to other metal powder forming which requires the application of high pressure from two different points.



Pointing out that the powder metallurgy process has tremendous post-war possibilities because such metal parts require little machining or finishing, Hydraulic Press remarks that such items as carbide tools, oil-less bearings and similar powdered metal parts are commonplace. Powder metallurgy makes it possible to produce parts that are harder, heavier or lighter than those made by any other method. There is no limitation to the metal which may be employed, and metal may be combined with non-metal.

This company believes the important item of equipment for powder metallurgy is the press. The press illustrated will exert a 1500-ton downward acting force, and a 1000-ton horizontal acting force. It is completely self-contained, being equipped with two radial hydraulic pumps which generate the operating pressure. Press operation is automatic, with electric pushbutton starting and automatic predetermined pressure reversal.

Mention R209 When Writing or Using Reader Service

See Pages 14-18 For Additional New Products

4,000 Attend War Conference Of Chicago Technical Societies

At a record breaking meeting, 4000 enthusiastic and interested engineers, scientists and manufacturers gathered at the Stevens Hotel on March 30, for the 2nd War Production and Related Problems Conference sponsored by the Chicago Technical Societies Council.

The purpose of the conference was to expedite the war effort by providing a means for the exchange of mutually beneficial ideas among engineering, technical and scientific societies, and interested manufacturers in the Chicago area. The conference was held in a series of 33 panel sessions in which all phases of war production and related problems were discussed. All panel discussions were led by recognized experts in their fields.

Composed of the representatives of 36 societies, the aims of the Chicago Technical Societies Council are: (1) To provide a medium for cooperative action by the engineering, technical and scientific societies in the mid-west on matters of mutual interest which are beyond the scope of individual societies or which can be performed better by cooperative action; (2) to provide means for more effective public service by the member societies; and (3) to cultivate greater appreciation by the public of the part which the engineering, technical and scientific professions have contributed to human welfare.

The Chicago Council is composed of two delegates from each member society including the American Society for Metals. K. H. Hobbie, who is corresponding secretary of the Council, is a former secretary-treasurer of the Chicago Chapter A.S.M.

Compliments

To WILLIS R. WHITNEY, honorary vice-president of the General Electric Co. and first director of its research laboratory, on the award of an honorary membership in the Electrochemical Society.

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To JUNIUS D. EDWARDS, assistant director of research, Aluminum Co. of America, on being named recipient of this year's Pittsburgh Award by the Pittsburgh Section of the American Chemical Society.

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To WILLARD HENRY DOW, president of the Dow Chemical Co., Midland, Mich., on the receipt of the 1944 Gold Medal Award of the American Institute of Chemists.

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To RALPH K. CLIFFORD on his election as vice-president and general manager of the Continental Steel Corp., Kokomo, Ind.

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To WALTHER MATHESIUS, president and director, Geneva Steel Co., a past national trustee of the American Society for Metals, on the award of the Clamer Medal of the Franklin Institute, for valuable and outstanding contributions in converting the art of blast furnace operation to a science.

What's NEW in THE REVIEW

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PASS-A-ROUND

Many executives in your plant will want to see this record of what happened last month in the metal industry. Just fill in the names, note items for special attention—and Pass-A-Round.

Name	Item No.	Check

File or Clip for Future Reference

This is a record of important new developments in the metal industry during the past month—Save it for reference.

All Foundry Preprints Included in This Issue Of Literature Review

All of the 35 technical papers presented at the Annual Meeting of the American Foundrymen's Association held in Buffalo April 25 to 28 are annotated in this month's installment of the "Review of Current Metal Literature" starting on page 2.

Most of these papers will be found under Classification No. 14—Foundry Practice and Appliances, although some of them are given under other classifications, such as No. 3—Properties of Alloys, No. 12—Testing and Inspection, and No. 18—Heat Treatment.

In addition to these preprints, the Metal Literature Review covers all periodicals published between March 31 and May 1 which contain articles having any bearing on the field of metals. In addition to the better known metal magazines, this month's installment includes the preprints of the American Electrochemical Society, the British publication *Chemical Age*, the *Transactions* of the American Society of Mechanical Engineers, *Paint Technology*, *Mining World*, *Automobile Engineer*, and many others.

In all, over 400 articles and books have been reviewed and annotated under 27 different subject classifications. An additional "Materials Index" on page 19 classifies the articles according to the particular metal or alloy that is considered. The table of contents in the middle column below indicates the pages on which the various sections appear.

Gives Hints for Heat Treater To Overcome Prior Errors

Reported by C. H. Muehlemeyer
Metallurgist, O. T. Muehlemeyer Heat Treating Co.

Rockford Chapter—Because heat treating operations are usually performed when steel parts are near the finished stage, the heat treater is called upon to overcome the accumulated errors of material selection, design, and analyses mixups, especially in time of war. At the meeting on March 22, D. R. Edgerton of the Lindberg Steel Treating Co. presented with slides and description many of the ingenious methods which the heat treater can use to achieve the desired results in spite of such difficulties.

One of the most important "hints" was to prevent surface scaling in order to take full advantage of the hardenability of the steel involved. Even slight scaling during heating may prevent uniform full hardening in steels of low hardenability, because of the shielding effect exercised by the scale during the quenching operation.

Mr. Edgerton went into some detail regarding the cold treatment of high speed and tool steels. Virtually complete transformation of austenite in high speed steels is achieved by cooling directly from the quench to — 120° F. for 6 hr., followed by tempering at normal temperatures, again cooling to — 120° F. and then tempering a second time.

In the discussion the danger of cracking during cold treatment was brought up. The practice has been not to cold treat directly from the quench any high speed steel parts which, because of design or size are inherently likely to crack. Such parts are first tempered and then cold treated and, though more austenite is retained in this way, it is less undesirable than cracked tools. Oil hardening tool steels are always tempered prior to the first cold treatment.

Lithium Company Builds New Plant

The Lithium Co., Newark, N. J., has announced the construction of a new plant for the manufacture of small parts for lithium furnaces. This building will be 50 by 125 ft. and will have a traveling crane running its full length. It will also be used for the manufacture and high production of lithium cartridges.

A.S.M. REVIEW OF CURRENT METAL LITERATURE

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received in the Library of Battelle Memorial Institute, Columbus, Ohio, During the Past Month

1. PRODUCTION OF METALS

1-40. MacIntyre Development of National Lead Company at Tahawas, New York. *Mines Magazine*, v. 34; Feb., '44, p. 68-71, 77.
Flow sheet; concentrating the ore, metallurgical problems, power and maintenance.

1-41. The Spanish Metallurgical Industries. *Chemical Age*, v. 50, March 4, '44, pp. 233-234.
Future of the steel industry.

1-42. Vanadium Operations at Monticello, Utah. *Mining World*, v. 6, March '44, pp. 17-21.
Erected in the heart of the largest vanadium producing area in the U. S., the Monticello plant is operated for Metals Reserve by Vanadium Corp. of America.

1-43. Quail Hill. *Mining World*, v. 6, March '44, p. 22.
California's largest zinc producer in 1943.

1-44. Benefication of Alumina Clays. *Light Metal Age*, v. 2, March '44, pp. 22-24.
Methods by which Washington residual clays may be concentrated to increase their alumina content.

1-45. Segregation in Alloy Ingots and Large Castings. S. W. Poole. *Metal Progress*, v. 45, April '44, pp. 692-695.
An interplay of ideas derived from the theoretical progress of leisurely solidification of solid solution alloys, and the actualities of the situation as determined in melting shop and casting aisle, clarifies the puzzling occurrences of less-than-normal segregation—even negative segregation.

1-46. Iron Ores of the Pacific Northwest. Carl Zapffe. *Steel*, v. 114, April 10, '44, pp. 116, 118, 136, 138, 141.
Iron ores in Washington and Oregon are uncommon to the steel industry because they have not been subjected to adequate metallurgical tests nor the physical properties of resultant metallic determined. While they are unsuited to present-day steelmaking practice, yet there is the likelihood they will find application in electrothermic processes for making new products.

1-47. Mine to Market. *Business Week*, April 15, '44, pp. 60, 62.
New rail connection will speed delivery of ilmenite and concentrated iron ore, promote Adirondack area development.

1-48. The Role of Basic Slags in the Elimination of Phosphorus from Steel. Richard L. Barrett and William J. McCaughey. *Metals Technology*, v. 11, April '44, Tech. Pub. 1716, 8 pp.
Petrographic study; solid solution of calcium silicates and phosphates; mineralogical constitution of slag; removal of phosphorus.

1-49. Increased Open-Hearth Productivity. C. D. King. *Metals & Alloys*, v. 19, April '44, pp. 850-855.
Melting time vs. outages, furnace rebuilding, operating delays, bank and bottom repairs, charging delays, hot work repairs, teamwork boosts productivity.

1-50. Stepping Up Blast Furnace Blowouts. John D. Knox. *Steel*, v. 114, April 24, '44, pp. 110-112, 144.
After last cast debris is removed quickly by hydraulic means, salamanders are drained through passageway drilled in foundation masonry. Flushing eliminates dust nuisance, facilitates refractory removal, saves considerable labor and affords quicker start on tearout.

1-51. Why Use Cold Blast Charcoal Iron? W. H. Melaney. *Blast Furnace & Steel Plant*, v. 32, April '44, pp. 471, 480.
Why use cold blast iron and desirable qualities.

1-52. Automatic Control Features Zinc-Fuming Plant. B. H. Hodgins. *Engineering & Mining Journal*, v. 145, April '44, pp. 88-90.
Designed to permit recovery of zinc both from current operations and from waste dumps, the plant is served electrically from a central substation situated near the center of the load.

2. PROPERTIES OF METALS

2-16. The Recovery and Use of Molybdenum and Its Relation to Recent Metallurgical Developments. T. E. Norman. *Mines Magazine*, v. 34, Feb. '44, pp. 72-77.
History, ore reserves, operations at Climax, the relation of molybdenum to recent metallurgical developments, high strength engineering steels, stress engineering, alloys for elevated temperatures, high speed tool steels, other developments.

2-17. Activated Alumina. J. Harwood and W. Cule Davies. *Chemical Age*, v. 50, March 4, '44, pp. 223-228.
Properties and industrial applications.

2-18. Engineering Applications of Lithium. James F. Driver. *Machinery (Lloyd)*, v. 16, March 4, '44, pp. 37-40.
Lithium used as a deoxidiser in production of copper castings; addition to cast iron improves the density of the metal and gives better machinability. Fundamental properties of lithium studied.

2-19. A Brief History of Magnesium in America. Willard H. Dow. *Metal Progress*, v. 45, April '44, pp. 675-680, 718.
Efforts made to reclaim a chemical by-product and to learn how to alloy, fabricate and use magnesium, one of the war's most necessary munitions.

2-20. Aluminum for Present and Post-War Products. *Product Engineering*, v. 15, April '44, pp. 253-268.
A summary of the expanding possibilities of aluminum as affected by wartime production, applications, economic considerations, and experience in the design of strong, light-weight structures.

2-21. Versatile Indium. Fred P. Peters. *Scientific American*, v. 170, April '44, pp. 154-156.
Once valued at $20,000 an ounce, indium now sells for $7.50. Its peculiar properties open wide fields of use in high speed bearings, solders, jewelry, and as a hardening element in non-ferrous alloys. Not on the list of critical metals.

3. PROPERTIES OF ALLOYS

3-56. Comparing Structures in Metals and Plastics. Leslie P. Dudley. *Engineers' Digest*, v. 1, March '44, pp. 234-236.
Properties of sections composed of laminated 1/16-in. birch veneers in comparison with the properties of equivalent sections in other structural materials. The materials with which the plastic are compared are AZM magnesium alloy, duralumin and a typical mild steel.

3-57. Gas Turbines. Thos. Hamilton-Adams. *Iron & Steel*, v. 17, March '44, pp. 284, 294.
Possible alloys for use at temperatures up to 1500°C. and higher.

3-58. The Strength Properties of Aluminum-Copper-Magnesium Deep-Draw Alloys. *Light Metal* Age, v. 2, March '44, pp. 10-13, 35-37.
Investigated are the strength properties of aluminum-copper-magnesium deep-drawn alloys containing about 2% copper and varying percentages of magnesium and silicon after exposure to age hardening and tempering.

3-59. Aging and the Yield Point in Deep Drawing Steel Sheets. J. R. Low and M. Gensamer. *Steel Processing*, v. 30, March '44, pp. 165-167, 177.
Following changes are observed when low-carbon steel of the grades normally used for deep drawing is annealed in wet hydrogen: The yield point is completely eliminated and the stress for the beginning of plastic deformation is greatly reduced. Both strain-aging and quench-aging are completely eliminated. The carbon and nitrogen contents of rimmed steels so treated are markedly lowered.

3-60. The Progress of Metallurgy and Its Problems in Aircraft. V. N. Krivobok. *Metal Progress*, v. 45, April '44, pp. 657-663.
Post-aged aluminum alloys; new alloys; compressive strength, spot welding, formability; ferrous vs. non-ferrous alloys.

3-61. Gray Iron—Steel Plus Graphite. *Metal Progress*, v. 45, April, '44, pp. 703-704, 714.
Formation and functions of graphite in cast iron.

3-62. On the Strength of Highly Stressed, Dynamically Loaded Bolts and Studs. J. O. Almen. *SAE Journal*, v. 52, April '44, pp. 151-158.
The strength of dynamically loaded, highly stressed bolts and studs is determined by the man with a wrench. Other considerations, such as design, material, and processing, are of relatively minor importance. The elasticity of bolts and studs should be as great as possible. The bolted members should be as rigid as possible. Loss of dimension of the bolted members is particularly hazardous to the strength of short bolts and studs. No adequate means are available for determining nut tightness except when the elongation of the bolt can be measured.

3-63. Fracture and Comminution of Brittle Solids. Eugene F. Poncelet. *Metals Technology*, v. 11, April '44, Tech. Pub. 1684, 20 pp.
Comminution of brittle solids occurs in the following steps: 1. Deformation of the solid to be comminuted by the application of outside forces resulting in tensile stresses. 2. Development of one or more cracks as a direct result of these stresses. 3. Formation of compression and transverse pulses caused by these breaks to travel through the solid. 4. Generation of tension and more transverse pulses by reflection of the compression pulses at the solid's free boundaries, causing offspring cracks to form and progress. 5. Formation of residual particles of smaller and smaller sizes as the process is repeated. 23 ref.

3-64. Preferred Orientation in Annealed 70-30 Brass Wire. H. L. Burghoff and J. S. Porter. *Metals Technology*, v. 11, April '44, Tech. Pub. 1688, 11 pp.
The preferred orientation, which may be designated most simply by the fiber axis, (III), decreases in intensity as the semifinal annealing temperature increases, but increases in intensity as the severity of the final reduction by drawing temperature increases. The preferred orientation is accompanied by significant increases in yield strength, tensile strength and modulus of elasticity over the values obtaining in randomly oriented wire of similar grain size. 6 ref.

3-65. Solubility of Hydrogen in Molten Copper-Tin Alloys. Michael B. Bever and Carl F. Floe. *Metals Technology*, v. 11, April '44, Tech. Pub. 1703, 11 pp.
Results of an investigation of the solubility of hydrogen in representative compositions of the copper-tin system at temperatures ranging from above the liquidus to 1300°C. and at pressures from less than 50 mm. of mercury to about atmospheric. 17 ref.

3-66. Factors Affecting Rates of Work-Hardening in Primary Substitutional Solid Solutions. J. H. Frye and C. P. Sun. *Metals Technology*, v. 11, April '44, Tech. Pub., 1711, 5 pp.
Factors affecting rate of work-hardening pointed out and compared with factors previously shown to affect hardness. A program of research has been suggested, which should further clarify the understanding of hardness and of rate of work-hardening in solid solutions. 8 ref.

Immersed Electrode Furnaces Widely Extend Use of Salt Bath Heat Treating in Past Decade

Reported by L. Geerts
Republic Steel Corp.

Boston Chapter—"A remarkable change has taken place during the last decade in the application of the molten salt bath to commercial heat treating processes," said Harold J. Babcock, research engineer, Ajax Electric Co., guest speaker at the April 7th meeting. The title of Mr. Babcock's talk was "Electrode Type Salt Bath Furnaces in Modern Heat Treating Practice."

The exorbitant cost and indeterminate life of pots in externally heated furnaces, more than any other factors, have restricted more widespread use of salt bath heat treating. The main source of pot failures—erosion due to elevated heating temperatures—is not present in immersed electrode type furnaces. The inside of the pot is subjected to no higher temperature than that of the molten salt itself. Steel plate pots used for activated cyanide average about six times the life of externally heated pot furnaces.

Today, the internally heated salt bath is found in nearly every type of heat treating application, both ferrous and non-ferrous. It is no longer "a small pot furnace"; baths holding three carloads of molten salt are in operation with dimensions 26 ft. by 4 ft. by 7 ft. salt depth.

The solution to this problem was found in the application of closely spaced pairs of electrodes. The flow of 2000 to 3000 amperes through each pair produces a powerful electromotive stirring action. This use of the well-known "motor-effect" actually propels the molten salt downward and outward into the bath, thus maintaining uniform temperature throughout the entire bath.

Neutral hardening of carbon and alloy steels at temperatures from 1500 to 1850° F. has made rapid progress during these four years of war. Manufacturers have developed a neutral salt and imply that it will neither carburize nor decarburize the surface of the steel.

In the heat treatment of aircraft, tank and automobile engine parts, as well as armor piercing shot, the neutral salt bath receives finished machined parts. The freedom from distortion, scale, pitting, decarburizing and other surface defects permits working to close tolerances and reduces subsequent machining to a minimum.

The use of the salt bath for austempering, martempering and cyclic annealing is now finding many applications where low alloy or NE steels can be hardened without resort to drastic quenching. The introduction of a molten salt isothermal quenching furnace designed for production output ranging upward from 300 lb. of metal quenched per hour has transferred the S-curve from the metallurgical laboratory to a practical tool for the heat treat shop.

A. D. Bach, past chairman and president of the New England Metallurgical Corp., as technical chairman, directed a very interesting discussion period. The coffee speaker was Commander T. E. Ascherfield who told of his many interesting experiences on board the aircraft carrier "Wasp."

A. D. Bach (Left), Past Chairman of the Boston Chapter, Congratulates Harold J. Babcock, Ajax Electric Co., at the End of His Talk on Salt Baths. (Photo by H. E. Handy).

Post-War Changes In Steel Compositions Predicted by Kinzel

Reported by George G. Luther
Naval Research Laboratory

Washington Chapter—Speaking on "The Future Economy of Alloy Steels", A. B. Kinzel, chief metallurgist, Union Carbide and Carbon Corp., explained that the alloy-cost relationship governed steel purchases during normal times, but since the start of the war the aim has been to get the most from steels with the least amount of alloy regardless of cost.

The speaker grouped steels in four general categories: As-rolled or normalized structural; engineering and ordnance; tool; and stainless types.

Little change in the post-war era is expected in the compositions in the structural group. Substitutions for nickel have been made to a great extent, and it remains to be seen whether it will be used in the future to the extent it was during pre-war years. Vanadium, which was cut badly from the list of available metals, is definitely on the way back in manganese-vanadium types.

In the engineering and ordnance materials NE 8600 series proved to be the most popular substitute. Its composition is excellent for scrap purposes and the properties are close to the highly valid SAE 4130.

Dr. Kinzel remarked that the NE steels will serve to supplement the pre-war steels in lighter sections and where less strength is needed. By way of explanation, he pointed out that the martensite in alloy steels is more homogeneous than that in the carbon steels and gives rise to better combinations of properties in the quenched and tempered conditions.

It is expected that boron steels will find a place in the future economy where compositions are such that the material will not quite through-harden. Isothermal transformation curves for the same compositions but with and without boron are similar in slope but the curves for boron bearing steels are displaced to the right because the incubation time is lengthened. For shallow hardening steels, the addition of boron will not produce deep hardening. It is most effective when used with the usual alloys.

Kinzel proclaimed no notable improvements have been made in carburizing steels over pre-war types.

In the tool steels the 18-4-1 had to be modified because of the drastic restrictions on tungsten. "Six per cent W and more moly" was the general order for tool makers. It is problematic what the outcome will be since tungsten steels are coming back with the more recent lifting of restrictions and tool makers in general seem to prefer to make the pre-war types.

In the high temperature steels, many changes have been made. However, no complete substitute was found for nickel in austenitic types and without 12% chromium as a minimum, steels are not stainless. Manganese is a supplemental alloy for nickel, rather than a substitute. The role of nitrogen will be an important one for the future, Dr. Kinzel concluded.

Detroit Educational Program Draws 350 to Three Meetings

Reported by E. O. Kirkendall
Chairman, Educational Committee, Detroit Chapter

More than 350 people attended one or more of the three meetings in the educational program held during March and April by the Detroit Chapter.

The program got off to an excellent start with a paper on "The Characteristics, Handling and Use of Tool Steels and High Speed Steels," by Leonard C. Grimshaw of the Latrobe Electric Steel Co. Following this lecture Ray P. Kells, also of Latrobe, conducted a question and answer period on tool and tool steel failures.

For the second session of the series, a panel discussion on "Practical Heat Treatment Trouble Shooting" was planned. The meeting started with a 15-min. talk by Fred Young on "Troubles With Preparatory Treatments." Roy Roush then talked briefly on "Troubles in Carburizing," followed by Muir Frey on "Some of the Problems in Quenching." The preliminary talks were concluded by Gordon Baker, whose subject was "Heat Treat Trouble Shooting in Tool Steel."

For the final meeting of the series, Walter W. Edens of Ampco Metal, Inc. delivered a paper on "Aluminum Bronze Alloys."

The large interest shown in this educational program, in spite of excessive overtime work and transportation difficulties, has prompted the Detroit Chapter to consider both a fall and spring educational series next year.

Metal Literature Review—*Continued*

3. PROPERTIES OF ALLOYS (*cont.*)

3-67. Hardenability of Some Cast Steels. J. B. Caine. *American Foundrymen's Association* Preprint No. 44-9, April '44, 15 pp.

Because of the increasing use of heat treated steel castings, hardenability of cast steel has become important. Fundamentals of why steel hardens when quenched, and reasons for the adoption of a new test to measure hardenability discussed. Investigation to determine hardenability of some cast steels, and the correlation of these results with those of wrought steels, Actual results are also checked with those obtained, theoretically, from the chemical analysis. 7 ref.

3-68. Development and Properties of Sand Cast Aluminum Alloy Having High Strength After Aging Without Previous Heat-Treatment. Hiram Brown. *American Foundrymen's Association* Preprint No. 44-21, April '44, 15 pp.

Development and properties of a sandcast aluminum-base alloy containing magnesium, zinc, and small amounts of titanium and chromium. This alloy, B-81, has the ability to develop high strength properties on aging without undergoing previous heat treatment. 9 ref.

3-69. The Effect of Copper in Some NE and Low-Alloy Cast Steels. C. T. Greenidge, M. C. Udy, and K. Grube, *American Foundrymen's Association* Preprint No. 44-22, April '44, 16 pp.

Copper was added to three low-alloy, 0.30%, cast steels in amounts up to 0.50% and to a fourth steel in amounts up to 1.35%. Steels were tested for hardenability by the end-quench method and for tensile properties and hardness after water-quenching or normalizing followed by tempering. Low temperature notched bar toughness was determined on specimens similarly heat treated. Copper had no effect on the temperature required to draw to a specified hardness. Hardenability was mildly increased by copper. 9 ref.

3-70. Gray Iron as an Engineering Material. R. G. McElwee. *American Foundrymen's Association* Preprint No. 44-35, April '44, 9 pp.

Tensile strength, hardness, transverse strength, deflection, modulus of rupture, compressive strength, modulus of elasticity, plasticity, sheer strength, fatigue and endurance limit, impact, damping capacity, machinability, wear resistance, heat resistance.

3-71. Effects of Various Elements on the Mechanical Properties and Dezincification of Manganese Bronze. Alfred H. Hesse, Edwin T. Myskowski, and Blake M. Loring. *American Foundrymen's Association Transactions*, v. 51, June '44, pp. 821-836.

Effect of lead and other elements on manganese bronze has been studied in detail, especially in regard to the changes in mechanical properties and resistance to dezincification that may result from furnace charges of contaminated scrap metal. There appears to be little tendency for lead segregation in a well-made manganese bronze. More lead may be permitted if the copper-zinc ratio and the tin content are carefully controlled. Tin appears to be one of the best inhibitors of dezincification. Phosphorus, arsenic and lead are in general effective to a certain extent. Antimony not only decreases ductility seriously but also tends to increase the dezincification.

3-72. The Effect of Lead on Some Mechanical Properties of Manganese Bronze. George P. Halliwell. *American Foundrymen's Association Transactions*, v. 51, June '44, pp. 837-868.

Test bars, metal used, results and discussion, metal and pouring, tensile strength, ductility, yield strength, hardness, regular manganese bronze, leaded manganese bronze, iron and aluminum content, variation in copper and lead. 7 ref.

4. STRUCTURE

4-9. High-speed Tensile Impact Tests on Single-Crystal and Polycrystalline Bars of Copper. E. R. Parker and E. A. Smith, *Metals Technology*, v. 11, April '44, Tech. Pub. 1704, 7 pp.

Investigations have shown that the tensile strength, yield strength and elongation generally increase with increasing strain rate. The investigation reported herein is an attempt to determine the reason for the increase in strength and elongation. 11 ref.

4-10. The Structure of Anodic Oxide Coatings. J. D. Edwards and F. Keller. *Metals Technology*, v. 11, April '44, Tech. Pub. 1710, 12 pp.

Use of special metallographic techniques for reveal ing the structure of anodic oxide coatings on aluminum has been demonstrated. Characteristic structure can be revealed in an oxide coating by microscopic examination, but it is evident that fine details—for example, pore size, pore spacing and profile at the metal-oxide interface—are beyond the resolving power of the optical microscope. Data regarding the fine structure of an oxide coating have been augmented by the use of an electron microscope. 9 ref.

5. POWDER METALLURGY

5-7. Magnesium Powder Fabrication. *Light Metal Age*, v. 2, March '44, pp. 17-19, 24, 30, 38.

Milling and classification, detailing recommended methods, machinery and precautions.

5-8. Design of Powder Metallurgy Parts. M. T. Victor and C. A. Sorg. *Metals & Alloys*, v. 19, March '44, pp. 584-589.

Competitive advantages and disadvantages of powder metallurgy as a fabricating process, and several basic design rules specially applicable to powder metallurgy parts.

5-9. Latest Developments in the Art of Powdered Metallurgy. P. D. Aird. *Modern Industrial Press*, v. 6, March-April '44, pp. 36, 40, 54.

Techniques which will be used after war is over.

5-10. Large Carbide Die Nibs Formed by Hot Pressing. *Metal Progress*, v. 45, April '44, pp. 681-682.

"Hot press" method which incorporates in one single operation the three distinct processes of pressing, semi-sintering, and sintering.

5-11. Powder Metallurgy and the "Magal" Age. J. L. Bray. *Industry & Power*, v. 46, April '44, pp. 62-64, 120.

Through an analysis of the advantages and limitations of the process of making products from mixtures of metal powders, Bray reaches the conclusion that although the procedure is by no means a panacea for foundry or machine shop ills it has a most promising future.

5-12. Copper in Powder Metallurgy. J. J. Cordiano. *Electrochemical Society Preprint* No. 85-4, April '44, 10 pp.

After describing briefly the three methods of making copper powder (1) by electrolysis, (2) by reduction of the oxide, and (3) by atomization, results are reported on the effect of particle size and shape of copper powders. Description of the production of porous bearings; tungsten-copper electrode tips; and steel-backed copper-base bearings. 9 ref.

5-13. Electrodeposition of Copper Powder. W. H. Osborn and S. B. Tuwiner. *Electrochemical Society Preprint* No. 85-5. April '44, 10 pp.

Powder production is made a part of the process of electrolytic refining of copper. The powder is a by-product of the refining operation. Great potential economy is possible, but can be realized only with large scale production of this powder which in turn awaits development of uses for the powder. 14 ref.

6. CORROSION

6-10. Corrosion. *Automobile Engineer*, v. 34, March '44, p. 114.

Improved resistance of cladded A1-Zn-Mg alloys.

6-11. Laboratory Evaluation of Corrosion Resistance of Bearing Alloys. L. M. Tichvinsky. *Electrochemical Society Preprint* No. 85-2, April '44, 16 pp.

Testing equipment and procedures used at the U. S. Naval Engineering Experiment Station for laboratory determination of corrosion characteristics of bearing alloys.

6-12. The Effect of Specimen Position on Atmospheric Corrosion Testing of Steel. C. P. Larrabee. *Electrochemical Society Preprint* No. 85-8. April '44, 8 pp.

Methods of exposing atmospheric corrosion test specimens described. It is shown that steel specimens, when mounted on racks at an angle of 30° to the horizontal, corrode less on the surface exposed to the sky than on the side toward the ground. In applications such as roofs where the underside of the sheet is not exposed, the expected life might be two or more times that indicated by tests where both sides are exposed. 6 ref.

7. PROTECTION

7-37. The Protection of Magnesium-Base Alloys. A. W. F. Thynne. *Paint Technology*, v. 8, Nov. '43, pp. 171-173.

Why paint adhesion is poor, the pigment, the medium, the complete paint system.

7-38. Rust-Proofing. *Automobile Engineer*, v. 34, March '44, pp. 109-110.

Prevention of corrosion by the use of non-metallic phosphate coatings. Parkerizing process developed by the Pyrene Company, Ltd. for rust-proofing iron, steel and zinc.

7-39. Coating Magnesium Alloys. Ernest J. Gruen. *Light Metal Age*, v. 2, March '44, pp. 14-16, 32.

Recommended methods for selecting and applying various types of coatings to prevent corrosion of magnesium alloys. Discussed are impurities, surface cleaning, dichromate, seal chrome pickle, chrome sulphate, H. F. alkaline dichromate, alum dichromate, selenic, anodic, fluoridic, sodium hydroxide and painting treatments. 27 ref.

7-40. Bonding of Steel and Aluminum. Marshall G. Whitfield and Victor Sheshunoff. *Aero Digest*, v. 44, March 1; '44, pp. 86, 88, 222, 224.

A new aluminum-to-steel chemical bond, known as the "A1-Fin" process. It makes possible marked reduction in the structural weight of an air-cooled engine and greatly improves the cooling efficiency of its cylinders.

7-41. Basic Principles of Combustion Engineering of Hot-Dip Galvanizing Furnaces. Wallace G. Imhoff. *Industrial Gas*, v. 22, April '44, pp. 25, 43-48.

Discussion of fuels from viewpoint of heating hot-dip galvanizing furnaces: Gas fuel.

7-42. Salvage by Electrodeposition. Harold Narcus. *Metal Finishing*, v. 42, April '44, pp. 200-202, 207.

Salvage using "hard" or industrial chromium deposits; salvage using heavy nickel deposits; salvage using iron deposits.

7-43. Lockheed Requirements for Protective Coatings. Maxwell Stiles. *Industrial Finishing*, v. 20, March '44, pp. 18, 22, 24, 28, 30, 32, 38.

Zinc chromate primer; its purpose and proper thickness. Protective coatings for interior surfaces. For exterior surfaces; customer's specifications. Treatment of surfaces at joints and seams. Insulation to prevent direct contact of dissimilar metals. Surface treatment of aluminum and aluminum alloys. Anodic treatment for aluminum alloys. Treatment of magnesium. Acid, alkali-resisting paint. Protective coatings for cables and fittings; compartments. For junction boxes; liquid lines and tubing.

7-44. Worn Machine Tools, Reclaimed by Metallizing. *Western Metals*, v. 2, April '44, p. 27.

Reclaiming worn machine tools and other moving parts receiving exceptional wear that are necessary to the production of warplanes with metal spray.

7-45. Republic Uses Pentrating Process. *Iron Age*, v. 153, April 13, '44, p. 65.

Pentrating is a salt-mixture controlled oxidation process applied to ferrous metals. The lustrous black finish which results adds to the durability of the metal surface and has marked anti-friction and anti-rust qualities.

(Continued on page 4)

The REVIEW
THE MONTHLY SURVEY AND DIGEST OF WHAT'S NEW IN METALS

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Ray T. Bayless.....*Editor*
M. R. Hyslop.....*Managing Editor*

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Volume XVII Number 5

Cleanliness Essential To Protect Fine Finish

Reported by W. A. Mudge
The International Nickel Co., Inc.

New York Chapter—It was Waring vs. Waring when R. W. Waring, of Sperry Gyroscope Co., introduced C. E. Waring, of Frigidaire's Materials and Process Engineering Division, and the upshot was that approximately 100 members and guests heard a most interesting lecture and learned a new use for fingerprinting.

Dr. Waring's story covered methods for protecting fine metal finishes. It began and ended with emphasis on cleanliness; first, the procedures for arresting and preventing corrosion during manufacture and second the final treatment for shipment.

A clean metal is free from dirt of all kinds and other contaminants which may etch, mar or corrode its surface. Cleaners for the purpose include solvents, alkalis, emulsions and drying compounds. Stoddard solvent is satisfactory to remove grease, and methanol for fingerprints. Methanol is not allowed to contain more than 10% of water.

Tests for satisfactory cleaning are made by fingerprinting. The finger is dipped in a solution of urea, lactic acid, sodium chloride and methanol, pressed on a test specimen, covered with a rust preventive, and exposed in a salt spray or a constant humidity chamber.

Many slides, including some beautiful kodachromes, were shown to illustrate methods of testing and results with various types of cleaners, rust preventives, inhibitors, and ordnance preservatives.

Dr. Waring described also the methods of careful inspection which are necessary to effect the highest quality of production standards. Great vigilance and care must be exercised always to offset a series of factors, any one of which might interfere with the performance of military equipment.

Wire Assoc. Elects Officers Will Meet at Metal Show

At the annual meeting of the Board of Directors of the Wire Association the following officers were elected for the ensuing year:

PRESIDENT: D. D. Buchanan, manager of operations, Union Drawn Steel Division, Republic Steel Corp.

VICE-PRESIDENT: R. M. Hussey, superintendent of wire department, Jones & Laughlin Steel Corp.

VICE-PRESIDENT, NON-FERROUS DIVISION: E. W. Gundstrom, assistant plant manager, Rome Cable Co.

EXECUTIVE SECRETARY: R. E. Brown, publisher, *Wire & Wire Products.*

New directors seated at the meeting were Kenneth H. Davis, president, K. H. Davis Wire & Cable Co., and Flint C. Elder, special research engineer, American Steel and Wire Co.

It was voted to hold the 1944 convention at Cleveland in association with the American Society for Metals and the National Metal Congress. The general chairman for the program committee will be Mr. Gundstrom, cooperating with the chairman of the Non-Ferrous Division Program Committee, C. A. Litzler of Industrial Oven Engineering Co.

Dr. Zapffe Reveals "Fallacies" of Solids, Liquids and Pressure

Reported by Emil Gathmann, Jr.
Chief Engineer, Gathmann Engineering Co.

Baltimore Chapter—Striking out in new fields of metallurgical thought, Dr. Carl A. Zapffe stirred the imagination of the members at the March meeting.

Dr. Zapffe, formerly of Battelle and now assistant technical director of Rustless Iron and Steel Corp., was credited with one of the most unusual and inspiring talks ever delivered before this group. Scientist Zapffe prepared his audience for several amazing statements by first reviewing some of the unexplained occurrences in nature and contended that a wise metallurgist holds nothing is impossible until it is proven to be.

Carl A. Zapffe

"A fallacy of the solid state" was described by Dr. Zapffe as the wide acceptance of the assumption that metal crystals possess homogeneous internal structures, or regularly arranged atomic systems. Challenging this concept, he pointed to considerable evidence suggesting intracrystalline discontinuity, and described how numerous phenomena find a more reasonable explanation when crystals are conceded to have an "internal surface."

Explains Science of "Fractography"

More convincing, however, were Dr. Zapffe's unusual slides showing strange irregularities in the fractured surfaces of the individual crystals under high magnification. Dr. Zapffe is the inventor of a novel metallographic technique which permits microscopic examination of fractured surfaces at high magnification—a new research tool of science which he refers to as "fractography"—the study of fractures.

As the second phase of his prophetic remarks, Dr. Zapffe discussed "a fallacy of the liquid state." Asserting that LeChatelier's original applications of chemistry to steelmaking had since been generally misapplied, he cited the deoxidation reaction with silicon as a specific example. While it is generally supposed that oxygen dissolved in steel combines with silicon to form the usual silica, a secondary reaction also occurs which forms silicon monoxide.

Produced in the furnace at steel making temperatures, this divalent oxide of silicon is apparently soluble in steel, and this fact may help to explain some undesirable or unexpected properties of steels and irons containing much silicon.

Recognition of the occurrence of this and similar suboxides has other practical consequences.

Dr. Zapffe concluded his talk by referring to "a fallacy of pressure." He suggested that we have largely forgotten that our metallurgical constitution diagrams are based on the assumption of constant pressure, which is often far from a true condition. In fact, in his opinion, the double iron-carbon diagram may simply represent two sections of a true solid metal, one taken at ordinary pressures, the other at the internal pressure of steel, which may be the factor which stabilizes iron carbide at ordinary temperatures.

Dr. Zapffe's lecture was followed by an interesting talk by Gil Klingel, also of the Rustless Laboratories, who described his research adventures while shipwrecked on the island of Inagua in the West Indies.

Climax Molybdenum Opens New Office With Crosby and Patton in Charge

The Climax Molybdenum Company announces the opening of offices at 624 Fisher Building, Detroit, to handle the company's sales and service work in Michigan, Indiana and the Toledo district.

V. A. CROSBY, who has been associated with the company for the past ten years as metallurgical engineer and sales representative will be in charge of the office. W. G. PATTON, also to be stationed at this office, will have charge of the compilation and publication of technical data on molybdenum steels and irons.

The company's research work will continue at the laboratory of the Climax Molybdenum Co. of Mich., Detroit, under the direction of A. J. HERZIG, vice-president and chief metallurgist.

Metal Literature Review

7. PROTECTION (*cont.*)

7-46. Protectively Coating Fruehauf Trailers. Fred Boynton. *Industrial Finishing*, v. 20, April '44, pp. 28-30, 32, 34.
Protective coatings essential, thorough metal cleaning, red oxide primer plus lusterless paint, cleaning and painting parts before assembly.

7-47. Water Thinned Primer Used in Aircraft Work. Maxwell Stiles. *Industrial Finishing*, v. 20, April '44, pp. 46, 48, 50.
To save strategic materials, water-thinned zinc chromate and other coatings have been developed to the point where they can be used effectively in regular aircraft finishing.

8. ELECTROPLATING

8-31. Iron Plating. William B. Stoddard. *Iron & Steel*, v. 17, March '44 pp. 292-294.
An improved solution for depositing ductile metal.

8-32. Electrotinning Operations. H. P. Munger. *Iron & Steel Engineer*, v. 21, March '44, pp. 53-64.
Built for DPC by Republic, each of these two electrotinning lines are designed toward the production of high quality plate under carefully controlled conditions.

8-33. Pre-Plated Metals in Wartime. *Steel*, v. 114, April 3, '44, pp. 120, 162, 164.
Lower cost electrocoating to displace piece plating.

8-34. Porous Chromium Plating Diesel Cylinder Liners. *Iron Age*, v. 153, April 6, '44, pp. 50-53.
Plating cylinder walls with a thick layer of hard chromium, applied by a process that leaves the plated surface in a porous condition, has increased cylinder life as much as 2000%.

8-35. Nickel Plating. Thomas McFarlane. American Electroplaters' Society *Monthly Review*, v. 31, April '44, pp. 341-349.
New developments in this field.

8-36. The Fundamentals of Chemistry for Electroplaters. Samuel Glasstone. American Electroplaters' Society *Monthly Review*, v. 31, April '44, pp. 351-354.
Chemical formulas; their determination and use.

8-37. Porous Chromium in Engine Cylinders. Russell Pyles. American Society of Mechanical Engineers *Transactions*, v. 66, April '44, pp. 205-214.
Properties inherent in porous chromium which contribute to its low wear rate in engine cylinders, i.e., hardness, exceeding that of any other cylinder-lining material; high thermal conductivity; low friction coefficient, and low affinity for other metals; corrosion resistance, preventing surface deterioration. 12 ref.

9. ELECTROMETALLURGY

9-3. Pure Columbium. Clarence W. Balke. *Electrochemical Society Preprint* No. 85-3, April '44, 6 pp.
Separation of columbium from tantalum and other constituents by fractional crystallization of complex salts and fractionation of metal chlorides at elevated temperature produces a very pure columbium oxide. A new process for reducing this oxide to pure Cb metal is described.

9-4. The Reactivity of Aluminum, Zinc, and a Zinc Base Die Casting Alloy with Various Electrolytes. Joseph V. Petrocelli and Arthur Phillips. *Electrochemical Society Preprint* No. 85-6, April '44, 20 pp.
Electrochemical behavior of Al, Zn, a Zn base die casting alloy and its constituents. Corrosion current on pure Al and Zn determined by a cathodic polarization method and checked by weight loss measurements. Explanation offered of the mechanism of the blistering phenomenon in electrodeposits on zinc base die castings. 15 ref.

9-5. Correlation of Solution Potentials with Orientations of Single Crystals of High Purity Aluminum. C. J. Walton. *Electrochemical Society Preprint* No. 85-7, April '44, 14 pp.
Large-grained specimens of high purity aluminum were prepared by the strain-anneal method. Differences in solution potential with marked changes in orientation were very small, and perhaps were not significant. However, there were differences in the rate of attack of the different crystal faces which are considered of significance. 8 ref.

9-6. A Study of Impurities in Cobalt Electrowinning. Ruth E. Churchward, F. K. Shelton and R. G. Knickerbocker. *Electrochemical Society Preprint* No. 85-10, April '44, 20 pp.
In electrolyzing a standard fluoborate electrolyte containing 20 g. per l. cobalt as CoSO, 50 g. per l. boric acid, and 5 g. per l. NaF at 25 amp. per sq. ft. (2.7 amp. per sq. dm.) using lead anodes and stainless steel cathodes, the maximum tolerance for metallic impurities for the production of satisfactory 7-hour cobalt electrodeposits is in mg. per l.: Zinc 10; cadmium 1; arsenic (trivalent) 3; arsenic (pentavalent) 1; antimony (trivalent) 10; mercury (divalent) 1. Trivalent and hexavalent chromium in concentrations up to 100 mg. per l. were only slightly harmful, while nickel, copper, iron, and manganese were not found deleterious. 18 ref.

9-7. Determination of Small Amounts of Chloride in Copper-Refining Electrolyte by Potentiometric Titration. Yu-Lin Yao. *Electrochemical Society Preprint* No. 85-11, April '44, 6 pp.
Control method for the determination of small amounts of chloride in copper-refining electrolyte by potentiometric titration with silver nitrate solution. Silver-silver chloride electrode is used as the indicating electrode. A normal calomel electrode is used as the reference electrode. The equivalence point is estimated by finding the volume of titrant required to bring the cell to a definite potential.

Metal Literature Review—*Continued*

10. ANALYSIS

10-15. Dithizone as a Microchemical Reagent. F. T. Beaumont. *Metallurgia*, v. 29, Feb. '44, pp. 217-220.
Dithizone has now become established as a reagent for the detection and determination of small quantities of some metals. Some account is here given of its application to the detection and determination of Pb, Hg, Ag, Cu, Zn, Bi, Cd, Co, and Au.

10-16. Photoelectric Colorimetry. E. C. Pigott. *Iron & Steel*, v. 17, March '44, pp. 285-288.
Use of photocells in quantitative metallurgical analysis.

10-17. An Application of the Spectrograph to the Inspection of Fabricated Iron and Steel. H. F. Kincaid. *Optical Society of America Journal*, v. 34, March '44, pp. 141-146.
The spectrographic equipment in use at Farmall Works of the International Harvester Co. The operating technique and results obtained, with particular attention to the various controllable conditions which affect accuracy of results.

10-18. A Combined Method of Chemical Analysis for Cast Iron, Malleable Iron and Steel. Winfield B. Sobers. American Foundrymen's Association Preprint No. 44-1, April '44, 8 pp.
A combined chemical analysis routine for plain and alloyed cast iron, malleable iron and steel, has resulted in time saving for completng a number of determinations, as well as in the handling and weighing operations of the sample itself.

10-19. Spectrographic Analysis of Iron and Steel. H. F. Kincaid. American Foundrymen's Association Preprint No. 44-10, April '44, 12 pp.
A successful commercial installation and its operation are described. Influence of length of preburn, humidity changes, size of sample, etc., on the accuracy of spectrographic analysis is discussed in detail with experimental data. The analytical procedure involves the use of a single iron reference line for the quantitative determination of manganese, chromium, nickel, molybdenum, vanadium, copper, aluminum, and silicon in steel. The same technique is used for the quantitative determination of Si and Mn in gray iron foundry control work and in the testing of miscellaneous castings. Tables illustrating the lines used, excitation conditions, developing procedure, and the accuracy to be expected of the quantitative determination of five elements from a single spectrogram are presented.

11. LABORATORY APPARATUS, INSTRUMENTS

11-28. Automatic Control: Its Practical Application—Parts III and IV. W. H. Steinkamp. *Chemical Industries*, v. 54, March '44, pp. 372-376, 445.
The types of electrically operated controls and their principles of operation. Some modern uses of automatic control in distillation and metal coating work.

11-29. A New Electronic Relay Method. Joseph Razek. *Instruments*, v. 17, March '4, pp. 132-133, 162.
Method and operation of electronic tube used as a relay.

11-30. New Electromagnetic Method of Measuring Screw-Thread Leads to a Few Millionths of an Inch. H. T. Rights. *Instruments*, v. 17, March '44, pp. 134-135.
To solve the problem of precise lead measurement, Sheffield Corp. and Westinghouse Electric & Mfg. Co., have developed an electrical lead-measuring method.

11-31. Electron Tubes—Their Principles and Their Instrumentation Applications. Andrew W. Kramer. *Instruments*, v. 17, March '44, pp. 138-143, 156, 158.
Development of the electron-tube oscillator.

11-32. The Measurement of Large Ring Screw Gauges. J. W. Drinkwater. *Machinery (London)*, v. 64, March 2, '44, pp. 238-240.
The horizontal Omtimeter is an optical comparator arranged for measurement in a horizontal plane.

11-33. A Portable Bond Tester for Journal Bearings. E. A. Wolfenden. *Metals & Alloys*, v. 19, March '44, pp. 608-609.
A new portable car journal bearing-bond tester that has made possible note-worthy improvement in railroad journal bearings and the practical elimination of bond failures for at least one road. It supplements the hammer-and-ring test, shown to be meaningless insofar as the bond strength is concerned.

11-34. Chemical Analysis by Electron Microscopy. *Electronic Industries*, v. 3, April, '44, pp. 110-111.
Slowing up of electrons as they pass through test specimen measured and made to reveal its atomic structure.

11-35. Tubes in Metallurgical Research. E. V. Potter. *Electronic Industries*, v. 3, April '44, pp. 112-114, 216-218, 220.
Describing electronic devices in laboratory work and control applications in industry. 3 ref.

11-36. Automatic Control Equipment—II. Air Operated Controllers. W. H. Steinkamp. *Industry & Power*, v. 46, April '44, pp. 72-73, 120.
Air-operated on-off controls, wide throttling range control, and wide throttling range with automatic reset.

11-37. An Electronics Primer That Fills a Need. C. T. Pearce. *Industry & Power*, v. 46, April '44, pp. 74-75.
Summarizes the answers to questions about electronics. Lists five common characteristics and seven basic advantages.

11-38. Machine Shop "Magic". H. H. Slawson. *Modern Machine Shop*, v. 16, April '44, pp. 176-178, 180, 182, 184-186, 188, 190, 192.
Properly harnessed, a beam of light can be made to do the work of a safety guard, a starting or stopping lever, a temperature control instrument, a counter, or an inspector on quality or quantity, and do it better.

11-39. Fundamentals of Industrial Electronics. G. M. Chute. *Steel*, v. 114, April 3, '44, pp. 112-113, 148, 150, 152, 154, 156.
Principles of electronic tubes and their application.

11-40. Fundamentals of Industrial Electronics. G. M. Chute. *Steel*, v. 114, April 10, '44, pp. 100-101, 115, 142, 144, 146, 148-151.
Functioning of three-element tube used in relays for controlling many industrial processes, including injection molding, timing of machining and heat treating operations, rivet-heating and the like. Shows how electronic tubes can operate in practical circuits.

11-41. Application of Electron Microscope to Study of Aluminum Alloys. F. Keller and A. H. Geisler. *Metals Technology*, v. 11, April '44, Tech. Pub. 1700, 17 pp.
Results obtained in revealing the fine structure of various aluminum alloys by employing the electron microscope are considered encouraging. Many of the structures shown in this paper are far beyond resolution by the optical microscope. Available methods for preparing specimens are compared and a new method described. 37 ref.

11-42. Tips on Trouble Shooting Electronic Controls. W. D. Cockrell. *Welding Engineer*, v. 29, April '44, pp. 45-47.
Practical production equipment to be kept in tip-top operating condition.

11-43. Fundamentals of Industrial Electronics. G. M. Chute. *Steel*, v. 114, April 17, '44, pp. 108, 111, 112, 114, 144, 146.
Functioning of photoelectric relay and its applications ranging from simple counting devices to more complicated motor-reversing apparatus.

11-44. Electronic Torque Control Prevents Drill Breakage. *Iron Age*, v. 153, April 13, '44, pp. 66-67.
To avoid excessive drill breakage on a deep hole drilling operation, development of an electronic control that automatically backs out the drill when torque exceeds a given amount.

11-45. Electronic Control Speeds Production. H. G. Grondahl. *Machine Design*, v. 16, April '44, p. 154.
Production of spar beams. Automatic control proves accurate and speeds production.

11-46. X Marks the Spot. Albert G. Ingalls. *Scientific American*, v. 170, April '44, pp. 163-165.
Account of the new hillier electron microanalyzer now undergoing development at the RCA laboratories. Related to the electron microscope. It serves a different end, the elemental analysis of minute samples of matter.

11-47. Fundamentals of Industrial Electronics. G. M. Chute. *Steel*, v. 114, April 24, '44, pp. 100, 102, 104, 124, 126, 128, 130.
How electronic tubes serve as alternating current switches to close or open circuits, including large power circuits.

12. TESTING, INSPECTION AND RADIOGRAPHY

12-80. Ordnance Production Gaging. R. A. Bowman. *Instruments*, v. 17, March, '44, p. 136.
Accuracy of gage inspection.

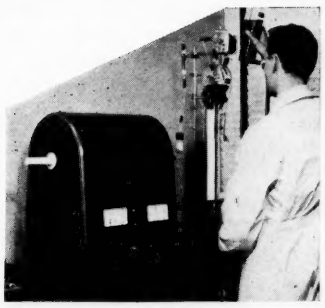
12-81. Electronic Sorting. *Iron & Steel*, v. 17, March '44, pp. 297-298.
Non-destructive qualitative and quantitative metallurgical testing.

12-82. X-Ray Inspection of Light Alloys. Robert Taylor. *Light Metal Age*, v. 2, March '44, pp. 20-21.
The selection of exposure factors for X-ray inspection; touches on the value and limitations of the fluoroscope, and suggests application of radiography in tensile tests of aluminum sheeting. 3 ref.

12-83. A Method of Measuring the Thickness of Helical Involute Gear Teeth. Joseph Reimer. *Machinery* (London), v. 64, March 9, '44, pp. 266-268.
Checking the tooth thickness of spur gears by the method of measuring across a number of teeth.

12-84. X-Ray Analysis of Light Metal Alloy Castings. Robert Taylor. *Aero Digest*, v. 44, March 1, '44, pp. 133, 200.
Destructive tests on critical materials are not practical and a reliable, non-destructive method of inspection has long been needed. Radiographic inspection has been accepted and is specified by various government agencies and engineering committees.

(Continued on Page 6)



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Metal Literature Review

12. TESTING & INSPECTION (*cont.*)

12-85. **Selecting, Evaluating and Specifying Metallic Materials.** H. W. Gillett. *Foundry*, v. 72, April '44, pp. 131-132, 272, 274, 278, 280, 282, 284, 286, 288.
Finding how to insure quality and freedom from scatter in metals more important than how to make chemical and mechanical post-mortems after service failure. Causes of variations in quality. 11 ref.

12-86. **Magnetic Testing.** Wm. K. Kehoe. *General Electric Review*, v. 47, April '44, pp. 59-60.
To control quality of ferrous alloy parts.

12-87. **Test Plugs Cut from Welds.** R. V. Anderson. *Metal Progress*, v. 45, April '44, pp. 696-697.
Methods commonly used in taking test plugs: Burning a section of the weld out of the seam with an oxy-acetylene flame; trepanning the test plugs with a "hole-saw"; drilling a ¼-in. pilot hole with an ordinary electric or air drill. Replace the drill in the arbor with a piece of ¼-in. drill rod, projecting far enough to go deep into the pilot hole. The drill rod has a greater degree of strength, and being perfectly smooth around the circumference, guides the hole-saw more evenly and it is thus possible to take any number of test plugs with one drill and one hole-saw.

12-88. **Radiographic Inspection of Metals.** Robert Taylor. *Steel*, v. 114, April 3, '44, p. 122, 124, 166, 168, 170.
Ability to define swiftly and accurately the outline of casting cavities or inhomogeneous structure in rolled steel is invaluable aid to producers and fabricators. Selection of right film is extremely important.

12-89. **Radium Radiography in Industry.** Robert Taylor. *Steel*, v. 114, April 10, '44, pp. 108, 110, 112.
Steam boilers, marine equipment and hydraulic power installations come under close scrutiny by radium's gamma rays. Once positioned, inspection equipment requires little attention. Radium lasts "forever." 9 ref.

12-90. **The Notched-Bar Impact Test.** John H. Hollomon. *Metals Technology*, v. 11, April '44, Tech. Pub. 1667, 25 pp.
An interpretation of notched-bar impact test that appears to be in agreement with the available published data. The interpretation discussed in this paper of the brittle failure of some steels in notched-bar impact test is similar to the qualitative analysis presented by Ludwig in the 1920's.

12-91. **Fluoroscopy and Radiography Combined in New Unit.** Robert Taylor. *Iron Age*, v. 153, April 20, '44, pp. 76-78.
Companies manufacturing die castings, molded plastic parts and assemblies, foundries that cast large quantities of small parts, producers of aircraft and other manufacturers who require mass X-ray inspection will find the combination unit described an efficient answer to many inspection problems.

12-92. **A Quantitative Hot Workability Test for Metals.** Harry K. Ihrig. *Iron Age*, v. 153, April 20, '44, pp. 86-89, 170, 172.
An elevated temperature, high-speed torsion test described for testing the hot workability of steels. Small bars are twisted to failure at various temperatures. The number of revolutions made before failure is a measure of the ductility of the metal at that temperature. These test data correlate very well with mill results in hot piercing operations.

12-93. **Conditioning of Steel Castings to Standards of Quality.** Paul Ffield. American Foundrymen's Association Preprint No. 44-18, April '44, 29 pp.
Application of non-destructive tests; influence of non-destructive testing on the conditioning of castings; radiographic standards of acceptability; practicability and interpretations of magnetic powder standards; significance of cracks in high-pressure, high-temperature castings; magnetic powder inspection as a complement to radiography; flame excavation of defects; magnetic inspection of flame-gouged areas.

12-94. **Magnetic Powder Inspection of Large Castings.** John F. Cotton. American Foundrymen's Association Preprint No. 44-25, April '44, 23 pp.
Shows that a standardized technique must be established before standards of magnetic powder inspection can be prepared.

12-95. **Fluoroscopic Inspection of Light Metal Castings.** Robert Taylor. *Metals & Alloys*, v. 19, April '44, pp. 869-873.
Inspection of light metal castings for internal flaws is conventionally done by radiography (X-ray photography). Increasing interest, however, is being shown in visual examination (i.e. without a permanent photographic record) by X-rays, using a fluorescent screen. Called fluoroscopic inspection, this obviously rapid process is still technically inferior to radiography in "sensitivity," but has already demonstrated its usefulness for pre-selecting or sorting of castings to be radiographed. This article discusses the process, its applications and its limitations, and describes available equipment for its industrial use.

12-96. **Exposure Graphs for Radium Radiography of Steel.** A. Morrison and E. M. Nodwell. *American Society for Testing Materials Bulletin*, No. 127, March '44, pp. 25-29.
Speed, contrast, latitude, use of the exposure graphs.

12-97. **Radium Radiography of Thin Steel Sections.** A Morrison and E. M. Nodwell. *American Society for Testing Materials Bulletin*, No. 127, March '44, pp. 29-30.
Use of radium for the radiography of steel and bronze has been limited to sections of 1 in. or more in thickness. Radium radiography has been sucessfully used on the welds in pressure vessels of wall thickness ½ to 1 in. where it was not possible to take them to an X-ray machine, or to bring an X-ray unit to them.

12-98. **Use of Film to Measure Exposure to Gamma Rays.** A. Morrison and E. M. Nodwell. *American Society for Testing Materials Bulletin*, No. 127, March '44, pp. 31-32.
As an aid in establishing and maintaining safe working conditions, a method of measuring the exposure received at any point, or by any person, over a period of time is needed. X-ray film can be used for this purpose provided that the limitations and the necessary precautions are understood.

12-99. **Continental Developments.** R. E. Blakley. *Machinery, (Lloyd)*, v. 16, March '44, pp. 56-57.
Further methods of testing bearings, beam balance or "see-saw" test, pendulum test, noise test, recorder adapter unit for indicating instruments.

Ontario Honors Past Chairmen; Hears Talk On Metal Protection

Past Chairmen N. P. Petersen, O. W. Ellis, W. J. Blair, J. H. Moore, J. F. Thomlinson, and C. L. Bailey Receive Certificates at Ontario Chapter Meeting.

Reported by G. L. White
Editor, Canadian Metals & Metallurgical Industries

Ontario Chapter—Past chairmen from the Toronto area were honored at the meeting on March 31. Appropriate certificates were presented to J. H. Moore, W. J. Blair, C. L. Bailey, O. W. Ellis, N. P. Petersen and J. F. Thomlinson.

The meeting was addressed by K. C. Compton, finish and corrosion engineer, Bell Telephone Laboratories, New York, on "Protection of Metals From Corrosion." Mr. Compton pointed out that the commonly used metals are often the most susceptible to corrosion, but that the use of alloys to prevent corrosion will become more important. Stainless steel, he said, is only the beginning.

Of the various types of corrosion, atmospheric is the most important. A major problem is the protection of steel, and the use of metallic coatings such as cadmium and zinc plate has become common for this purpose.

The speaker dealt with the effects of corrosion on magnesium and cuprous alloys, as well as the types of protection that have been used for various metals. He also discussed the effects of marine corrosion at some length.

British EN Steels Similar to NE Steels But Higher in Alloy

Reported by Vincent D. Barth
Process Engineer, Douglas Aircraft Co.

Tulsa Chapter — "Constructional Alloy Steels — 1944 vs. 1939" was the topic covered by John Mitchell, metallurgical engineer, alloy steels, of the Carnegie-Illinois Steep Corp. at the meeting on Feb. 28. Considered by Mr. Mitchell were all the constructional alloy steels used for various pre-war or war emergency applications over this period.

The backbone of his discussion was the explanation of developments leading to recent types of steel, notably the NE series. Most recent developments, according to the speaker, have been focused on the subject of hardenability and its possibilities for specification purposes.

In the development of this point Mr. Mitchell described the hardening of several steels to 300 and 400 Brinell and then the plotting of the resulting ultimate strengths, yield strengths, per cent reduction in area and Izod values. The physical properties of these steels were similar despite composition variations.

The speaker then traced details of the development of the NE steels with which he has been intimately associated. Of considerable interest was the fact that Canadian and British developments have paralleled those of the United States, although independent researches have been followed. British EN steels in many cases resemble our own; however, there is a tendency for British steels to contain a higher percentage of alloy content to compensate for less favorable heat treating equipment available there.

German practice is to replace nickel with chromium where possible to save the former element in the face of shortage. Russian steels are similar to British and American steels.

Mr. Mitchell also discussed some of the difficulties now being encountered, caused by the increasing accumulation of alloys in scrap, and the troubles encountered in charging high percentages of scrap into the open hearth and electric furnaces—50% to 60% respectively, by directive from WPB.

New Jersey Concludes Heat Treating Lecture Series

Reported by R. L. Rickett
U. S. Steel Corp. Research Laboratory

The New Jersey Chapter concluded its second series of educational lectures on April 3rd. This series covered heat treating processes and equipment, furnace atmospheres, cleaning of steel and, finally, finishing of steel parts and tools.

With the first series, which dealt largely with the fundamentals of heat treatment, the whole lecture course consisted of ten well-integrated lectures covering the heat treatment of steel in both its fundamental and practical aspects. The final lecture of this group consisted of a review of the fundamentals and was presented by Wm. C. Schulte who did such an excellent job in giving the first four lectures of the fall series.

The lectures on heating processes and equipment and on furnace atmospheres were given by R. J. Metzler, vice-president of B-M Heat Treating Co. Those on cleaning of steel and finishing of steel parts were by M. R. Murless, chief metallurgist, Monroe Calculating Machine Co.

Much of the credit for the success of this popular series of lectures should go to the Educational Committee, headed by F. P. Peters.

Function of CED In Post-War Outlined

Reported by J. J. Waller
Fairchild Aircraft, Ltd.

Montreal Chapter—Showing of the motion picture "The Romance of Iron and Steel" constituted the coffee talk period at the meeting on April 3. This film, produced by the American Rolling Mill Co., describes the entire manufacture of sheet steel from the time the iron ore is received at the steel mill. The iron is refined, cast into ingots, bloomed, hot rolled, pickled and then cold rolled to the required gage; it is then heat treated and straightened.

The talk of the evening was given by Bennett Chapple of American Rolling Mill Co., and dealt with "Charting the Future for Post-War." Mr. Chapple first described the history of the continuous rolling mill for the manufacture of sheet steel in the U.S.A.

As late as the end of the last war, sheet steel was manufactured by the so-called manual method. After a period of experimentation and design, the Armco mill in 1929 was finally developed to a stage where it could produce sheet steel on a commercial basis, and in 1939, the U.S.A. produced 12 million tons of sheet steel. When the present war broke out, it was the existence of the continuous mill that made it possible for the shipbuilding program in the U.S.A. to develop to its present state.

Mr. Chapple then expounded his views on the necessity for planning ahead. More than a year ago, a number of industrial leaders and economists set up a "Committee for Economic Development," whose sole object is to prevent economic maladjustment after the war. The committee operates through chairmen and vice-chairmen distributed throughout the country, who conduct a campaign for economic planning in local cities and communities.

The results of the committee's efforts are encouraging: As an example, Mr. Chapple cited the case of a small town which employed 6000 people before the war, and will be in a position to employ 7000 after the war. The success of the plan depends on the co-operation and far-sightedness of industry both large and small.

Talk on Ferro-Alloys Emphasizes Form and Manner of Adding Silicon

Reported by C. M. Hovey
Superintendent, Testing Laboratory
University of Manitoba

Manitoba Chapter—"Ferro-Alloys" was the subject of an address by W. Lathrop of Electro Metallurgical Corp. of Canada on March 9. Mr. Lathrop traced the development of the steel making industry and pointed out the effects of alloy additions to steel and cast iron.

The various methods of deoxidation were discussed and particular emphasis was placed on the form and manner in which silicon is added. The various classes of ferro-alloys used in the manufacture of alloy steels were outlined and Mr. Lathrop concluded his address with an excellent set of slides illustrating his remarks.

Metal Literature Review

13. TEMPERATURE MEASUREMENT AND CONTROL (PYROMETRY)

13-8. Built-in Automatic Temperature Controls. V. G. Vaughan. *Machine Design*, v. 16, April '44, pp. 129-133.
Potential applications, advantages and forecast for built-in temperature controls.

13-9. Control Equipments for Induction Melting and Heating Units. F. E. Ackley. *Industrial Heating*, v. 11, April '44, pp. 538, 540, 542, 544, 546, 580.
Controls for low frequency equipment, controls for higher frequency equipment, instrumentation, contactors, overload protection.

14. FOUNDRY PRACTICE AND APPLIANCES

14-113. Magnesium Foundry Practice. *Foundry Trade Journal*, v. 72, Feb. 17, '44, pp. 143-144, 146.
Helpful hints on running.

14-114. Cupola Operation and Control. R. C. Tucker. *Foundry Trade Journal*, v. 72, Feb. 17, '44, pp. 135-139.
Correlation between the latest theories and current practice. 9 ref.

14-115. Cupola Operation and Control. *Foundry Trade Journal*, v. 72, Feb. 24, '44, pp. 165-168.
The proper way to melt steel and the correct use of coke and instrument calibration are explained.

14-116. Internal Mechanics of Cast Iron. Gustav Meyersberg. *Iron & Steel*, v. 17, March '44, pp. 289-291.
Inherent properties in the light of German research.

14-117. A Small Moulding Unit. A. Wood. *Foundry Trade Journal*, v. 72, March 2, '44, pp. 175-179.
Shows the jobbing foundry the way to start mass production on sensible lines.

14-118. Light Steel Casting Production. *Machinery (Lloyd)*, v. 16, March 4, '44, pp. 50-51.
Summary of the advantages of light steel castings as made by the special process may be helpful. There is an almost total elimination of machining losses and considerable economies are effected by reason of the truth to form of the parts, which can, therefore, be jigged.

14-119. Steel Melting Practice. J. Preston. *Foundry Trade Journal*, v. 72, March 9, '44, pp. 199-203.
Melting practices used in Melbourne steel castings.

14-120. Light Alloy v. Ferrous Founding. J. Rostron. *Foundry Trade Journal*, v. 72, March 9, '44, pp. 205-206.
Light alloy as compared with iron founding.

14-121. The Production of Cast-Iron Pipes. Wm. Phillips. *Foundry Trade Journal*, v. 72, March 9, '44, pp. 207-209.
Mechanical methods, restricted to mechanical molding, hand methods, Indian practice, centrifugal castings, post-war conditions.

14-122. Centrifugal Casting Methods. Nathan Janco. *Iron Age*, v. 153, March 30, '44, pp. 42-45.
Good centrifugal castings depend on the molds, pouring procedures and spinning speeds employed. What methods to follow and how to eliminate casting defects are discussed.

14-123. Advanced Melting Methods. G. A. Lillieqvist. *Metal Progress*, v. 45, April '44, pp. 666-667.
Openhearth developments; acid electric furnace operation; alloy recovery.

14-124. High Strength, High Ductility Cast Steels. Carl F. Joseph. *Metal Progress*, v. 45, April '44, pp. 668, 669.
Raw materials, melting practice, deoxidation, microstructure, composition, heat treatment.

14-125. High Strength Cast Iron. G. L. Richter. *Metal Progress* v. 45, April, '44 pp. 669-671.
Improvement in gray iron castings has been due to: Improvements in melting practices, as well as in all features of molding, especially gating and risering practice; use of processing agents and alloys; heat treatment applications.

14-126. Centrifugal Casting. Chas. K. Donoho. *Metal Progress*, v. 45, April '44, pp. 672-673.
Types of centrifugal casting in commercial use: centrifuging; semi-centrifugal. True centrifugal casting, employed to produce tubular or generally cylindrical parts.

14-127. Pressure Molded Die Castings. David Basch. *Metal Progress*, v. 45, April '44, pp. 673-674.
Requirements for die castings in structural parts.

14-128. Producing Copper-Zinc-Silicon Bronze Castings. R. J. Keeley. *Foundry*, v. 72, April '44, pp. 120-121, 260, 262, 266.
Use of silicon as a substitute for tin in copper-base alloys.

14-129. Peace, Colleges and the Making of Castings. Clement J. Freund. *Foundry*, v. 72, April '44, pp. 122-123, 244, 246, 248, 250, 250, 252.
If the foundryman hopes to survive and prosper, he must attend to research, to education, and training after the war—and right now. 25 ref.

14-130. Produces Magnesium Castings. Edwin Bremer. *Foundry*, v. 72, April '44, pp. 124-125, 236, 238, 242.
Various features in production of magnesium alloy castings, principally for aircraft application. Detailed information on melting procedure as well as data on molding and core sands.

14-131. Casting Breech Rings for Guns. William G. Gude. *Foundry*, v. 72, April '44, pp. 126, 128, 266, 270.
Castings provide means for breaking bottlenecks in the war production program. Example of time saving efficiency given of breech ring for guns.

14-132. Factors in the Production of Quality Castings. William G. Reichert. *Foundry*, v. 72, April '44, pp. 130, 218, 220, 224, 226, 228.
Phases of foundry melting and pouring practice which influence quality of product.

14-133. Structure Control of Gray Cast Iron. R. G. McElwee and Tom E. Barlow. *Foundry*, v. 72, April '44, pp. 133, 256, 258-259.
Effects of temperature, time, and melting practice on properties of inoculated metal.

14-134. Increasing Engineering Applications Seen in Postwar Period for Die Castings. B. W. Hindman. *Steel*, v. 114, April 10, '44, p. 122.
Close laboratory, inspection controls have bearing on progress.

Forging Small Parts In Closed Dies With No Flash Explained

Reported by R. L. Rickett
Research Laboratory, U. S. Steel Corp.

New Jersey Chapter—A clear, and, to many, a new picture of the role of forgings in aircraft and other armament production was presented by R. W. Thompson at the March 20th meeting. Mr. Thompson, who is sales engineer for Transue and Williams Forging Corp., Alliance, Ohio, spoke on "New Developments in Ferrous and Non-Ferrous Forging Practice".

Of the vast number of forgings produced during the past year, approximately 99% went into some sort of armament, Mr. Thompson stated. These are subject to thorough inspection and must be of high quality. The ability to produce in such quantity and quality is a tribute to the forging industry and points to new applications of forgings in the post-war period.

Mr. Thompson classified forgings into two general types, closed-die forgings and flat-die forgings. The flat-die method is used where the size of the forging or small number of pieces required makes it uneconomical to produce a set of impression dies. Closed-die forgings are, of course, much more reproducible than those formed with flat dies and they can be made much closer to the desired final dimension. Most of Mr. Thompson's discussion was confined to the closed-die type.

Much progress has been made in closed-die forging and parts of rather complicated shape can now be made. Small forgings of symmetrical shape can be made in closed dies with no flash at the parting line; this is done by rotating the part in the die while it is being forged and allowing the excess metal to be extruded through an opening left in one end of the die.

According to the speaker, forgings are used in the aircraft industry in place of castings, not only to save weight but also, in some instances, because less machining is required or because the number of rejections due to poor quality castings can be reduced.

Forging of aluminum and magnesium alloys as well as steel was discussed in considerable detail by the speaker.

An outstanding event at this meeting was the adoption of a new constitution by the New Jersey Chapter. This constitution, prepared by a committee consisting of R. J. Allen, Wm. Klaile, S. Skowronski, J. W. Queen, Jr., and E. S. Davenport, was approved by unanimous vote of the members present.

Following the business meeting and preceding Mr. Thompson's talk, two motion pictures from the U. S. Army Air Forces were shown.

Salt Baths for Martempering, Isothermal Heat Treatment

Reported by Vincent D. Barth
Process Engineer, Douglas Aircraft Co.

Tulsa Chapter—A talk on "Heat Treatment in Salt Baths" by A. P. Seasholtz, metallurgist for E. F. Houghton & Co., presented before the meeting on March 29, began with an interesting discussion of the principles involved in the S-curve.

Some interesting slides on microscopic quench cracks were also shown. These cracks give low impact and fatigue strength values, and are caused by stresses set up by martensite formation.

Mr. Seasholtz pointed out that the advantages of air hardening steels can be secured by martempering, e.g., quench at 400° F. in salt, hold to equalize in temperature, and then air cool to room temperature.

A salt quench at 400° F. has a quenching speed as fast as an oil quench in many instances. Mr. Seasholtz gave as an example the case of a spline shaft made of NE 8447 and heated to 1550° F. which failed when oil quenched. When quenched at 500° F. in salt a satisfactory part was produced.

Knives were shown which demonstrated the avoidance of warping when salt quenched in contrast with considerable warping when oil and water quenched.

The differences between conventional heat treatment, austempering, martempering, and isothermal heat treating were described. The last named procedure now in use successfully on production parts consists of quenching in salt at about 400° F., followed directly by immersion in a salt tempering bath and subsequent air quenching. Satisfactory physical properties are being secured on close tolerance parts without distortion.

The discussion closed with a description of low temperature salt baths (300 to about 1100° F.) and medium range baths operating from 1000 to 1750° F.

Metal Literature Review

14. FOUNDRY PRACTICE (*cont.*)

14-135. Star Performance. John L. Kruetzkamp. *Die Casting*, v. 2, April '44, pp. 17-19.
Die castings transformed the Astro Compass from a virtually handmade instrument of high cost to one that could be made in great numbers with mass production methods without any sacrifice in accuracy.

14-136. Alloys for Die Casting. Part III—Copper. *Casting*, v. 2, April '44, pp. 45-47.
The physical properties and compositions of the more commonly used alloys for die casting. Advantages of brass die castings are discussed in detail.

14-137. Die Casting During and After the War. B. W. Hindman. *Die Casting*, v. 2, April '44, East Central Section Insert.
Demand, laboratory control, post-war.

14-138. Die Casting Copper-Zinc Base Alloys. James L. Erickson. *Western Metals*, v. 2, April '44, pp. 8-12.
Use of Al, Fe, Mn, Pb, Sn, Si, Ni, P, Be, Sb, and Bi as alloying elements. Corrosion resistance, annealing and how to obtain desired properties. Die steels, casting temperatures. 87 ref.

14-139. Malleable Mixture Calculation and Melting Control. M. E. McKinney. American Foundrymen's Association Preprint No. 44-4, April '44, 13 pp.
Choice and proportion of materials in malleable mixtures has been reduced to a purely mathematical formula based on the law of averages. Operation of a powdered coal fired air furnace is controlled by a continuous indicator of exit-gas analysis, coupled with a sensitive gauge showing draft or pressure inside the furnace.

14-140. Four-part Cheek Method of Producing Cast Iron Cylinders. Robert Hendry. *American Foundryman*, v. 6, April '44, pp. 38-42.
The castings produced by this method are clean and pass the water test without failure. Time saved in making cylinder castings by the method outlined is so good that this job has proved to be one of the best in the shop when computed on a tons-per-hour basis.

14-141. Heading and Gating of Malleable Iron Castings. A. J. Klimek. *American Foundryman*, v. 6, April '44, pp. 49-51.
Methods of heading and gating that solved some problems for one foundry.

14-142. Developing the Centrifugal Casting of Non-Ferrous Metals. I. E. Cox. *American Foundryman*, v. 6, April '44, pp. 56-59.
A constructive review of problems relating to centrifugal casting of non-ferrous bearing metals. The research approach toward developing a mechanized method of centrifugal casting production.

14-143. American Practice for Degassing of Aluminum Alloys. R. E. Ward. *American Foundryman*, v. 6, April '44, pp. 61, 63.
Summary of three of the most commonly used American practices for degassing aluminum alloys brings out the salient features of the double melt process, gas fluxing, and salt fluxing.

14-144. A Study of Molding Methods for Production of Sound Castings. F. G. Sefing. *American Foundryman*, v. 6, April '44, pp. 66-70.
Pouring gates should be designed so that clean metal enters the mold quietly and rapidly. Controlled directional solidification assists the freezing of the casting to begin at the coldest metal. Design and pour risers so they will assuredly feed castings by conforming to the principles of controlled directional solidification. Knock-off risers are convenient to remove and they feed adequately; chills or denseners are used where risers are impracticable, or where we wish to assist the freezing rate. Adequate venting of the mold cavity permits filling the mold easily by preventing back pressure. 6 ref.

14-145. The Mechanized Production of Aluminum Gravity Die Castings. John Vickers. American Foundrymen's Association Preprint No. 44-3, April '44, 60 pp.
Advantages of gravity die casting: Smoother finish and closer dimensional accuracy; greater possible speed of production; conservation of raw material; reduction of production scrap; and improved mechanical properties in the casting.

14-146. Centrifugal Castings. Peter Blackwood and John Perkins. American Foundrymen's Association Preprint No. 44-5, April '44, 38 pp.
The types of centrifugal castings have been briefly classified into three groups: (1) Die molds, (2) semi-centrifugal—center pour, (3) true centrifugal—cylindrical shapes, the inside diameter of which is governed by the volume of metal poured. In the foundry with which the authors are connected, they have been classified into the following groups: (1) Dry sand spinning, (2) die mold spinning, (3) green sand spinning. This paper is based on the latter types.

14-147. Heat Flow Problems in Foundry Work. Victor Paschkis. American Foundrymen's Association Preprint No. 44-6, April '44, 22 pp.
More common thermal problems encountered in foundry work. Foundation of analogy method and description of apparatus, "Heat and Mass Flow Analyzer," available at Columbia University which facilitates application of this method. Shows application of electric analogy method to specific foundry problems; that of the optimum size of the opening in the sand core between the casting and the feeding head of the casting.

14-148. Die Casting Aluminum Alloys by the Cold Chamber Process. S. U. Siena. American Foundrymen's Association Preprint No. 44-7, April '44, 8 pp.
The alloys used, details of the process and recommendations to be observed to secure the best possible product. Casting and die design and the factors involved, such as die preheating, die coatings, metal injection speeds and pressures, metal and die temperature control and melting practice. Proper inspection to secure the best possible product emphasized.

14-149. The Melting of Non-Ferrous Metal in the Cupola. Leighton M. Long. American Foundrymen's Association Preprint No. 44-8, April '44, 8 pp.
Design and operation of cupolas for melting prealloyed base alloys. Advantages of cupola melting for non-ferrous metals. 6 ref.

(Continued on page 8)

Bureau of Standards Studies Hardenability With High Purity Alloy

Reported by George G. Luther
Naval Research Laboratory

Washington Chapter turned out "en masse" to hear one of its favorite sons and past chairmen at the February meeting. S. J. Rosenberg, metallurgist, National Bureau of Standards, spoke on "Microstructural Characteristics and Hardenability of Iron-Carbon Alloys".

The starting point of any study of the effect of alloying elements on steel must be data on high purity iron-carbon alloys, Dr. Rosenberg pointed out. Much important work on these alloys was done at the Bureau of Standards in collaboration with T. G. Digges.

The alloys under study were prepared by carburizing vacuum fused electrolytic iron in a hydrogen-benzene mixture for lengths of time depending upon the carbon content desired. Homogeneity of the alloys was obtained by heat treating the carburized specimens 8 in. long by 0.040 in. thick by 0.3 in. wide in vacuo. The total maximum value of all impurities determined by the spectrochemical, chemical and vacuum fusion methods of analysis was about 0.03%. The carbon range for the alloys studed varied from 0.23 to 1.21%.

Rosenberg reported that austenitic grain size was determined for the alloys at a temperature sufficiently high to dissolve all the carbon. A temperature of 1700° F. was selected and this did not disturb the grain size for the lower carbon alloys. Each of the alloys had an average grain size of No. 4 A.S.T.M. or 6 to 12 grains per sq. in. at 100 diameters with the selected rates of heating.

Critical cooling rates were determined also as part of the investigation. Same size specimens were used and again a quenching temperature of 1700° F. was maintained. Since the only variable in those experiments was the influence of carbon content of the austenite, the differences observed in the hardenability are attributed to this factor.

The speaker pointed out that with similar conditions of austenitic grain size, carbon content and complete solution of the carbon in the austenite, the high purity iron-carbon alloys hardened less deeply than do plain carbon steels. It was also shown that a small change in the carbon content of the lower carbon alloys had a more marked effect on the critical cooling rate than did a corresponding change in the higher carbon alloys. The effect of rate of heating on austenite grain size and the formation of austenite was also discussed.

Chicago Pioneer Steel Man Dies

JAMES STEWART NICOLL, pioneer steel man and for more than 35 years a familiar figure in Chicago industrial circles and a prominent figure in the early development of the Clearing Industrial District, died March 29, following an illness of several months.

Mr. Nicoll was born in Chicago in 1891, and at 17 became associated with Kelly O'Leary Steel Works, and was vice-president at the time of his death.

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Metal Literature Review

14. FOUNDRY PRACTICE (*cont.*)

14-150. Problems Encountered in Making and Heat Treating Castings of an Air Hardening Steel. Gordon W. Johnson. American Foundrymen's Association Preprint No. 44-11, April '44, 4 pp.; also *American Foundryman*, v. 6, April '44, pp. 64-65.

Cleaning, machining, and heat treating of air-hardening steel castings which will meet the requirements of low distortion, hardening throughout, and freedom from strains and cracking.

14-151. Brazil Produces Steel Castings to Replace Forgings and Fabricated Parts. Henryk Zimnawoda. American Foundrymen's Association Preprint No. 44-12, April '44, 12 pp.

Castings produced to replace forged or fabricated parts. Gives methods of molding, pouring, and heat treating.

14-152. Factors Involved in Superheating Gray Cast Iron and Their Effects on Its Structure and Properties. A. Wm. Schneble and John Chipman. American Foundrymen's Association Preprint No. 44-13. April '44, 46 pp.

Data are interpreted as showing that super-heating effects are not to be attributed to destruction of residual nuclei. Results are also out of harmony with theories of nucleation by non-metallic particles. It is concluded that CO is the chief factor operating to produce the effects of superheating. It is postulated that this gas acts as a graphitizer during solidification, and that the principal effect is that of a carbide stabilizer or remover. 30 ref.

14-153. Gating and Feeding Malleable Pipe Fittings. Morris L. Hawkins. American Foundrymen's Association Preprint No. 44-14, April '44, 11 pp.

Foundry practices for production of sand-cast malleable iron pipe fittings. Careful selection of patterns and methods of gating, followed by a thorough inspection of trial castings. Permanent gating arrangement for patterns mounted on a single match plate illustrated by detailed drawings. The necessity for close control of molding sand, metal composition and metal temperatures for the manufacture of sound, pressure-tight malleable fittings is emphasized.

14-154. Standards in Times of Emergency. Phil Carroll. American Foundrymen's Association Preprint No. 44-15, April '44, 11 pp.

What is speed? Compromises injurious; essentials of progress: Manpower, training, effective timestudy methods. Timestudy simplified, rate setting deficiencies. Explaining standards, application of data methods, set-up standards, delay time, product vs. department measure, supervisory help, total effectiveness.

14-155. Alterations in Cast Iron Properties Accompanying Use of a Strong Inoculant of the Silicon-Manganese-Zirconium Type. C. O. Burgess and R. W. Bishop. American Foundrymen's Association Preprint No. 44-16, April '44, 35 pp.

Essential functions of an inoculant, and the tests made to determine the suitability of silicon-manganese-zirconium inoculant employed. 8 ref.

14-156. Introductory Observations on the Rate of Solidification of Malleable Iron. B. C. Ywarly, R. P. Schauss and P. A. Martin. American Foundrymen's Association Preprint No. 44-19, April '44, 16 pp.

Solidification, casting design, feeders and heads, volume change and heat loss, solidification tests and rates. When the freezing rate has been accurately determined it should be possible to predict how any section of a casting may be fed.

14-157. Some Causes of Test Bar Failures in Navy "G" and "M" Metals. Wm. B. George. American Foundrymen's Association Preprint No. 44-23, April '44, 10 pp.

Cost of not paying attention to the casting of test bars is often expensive to the foundryman. When a test bar fails, the foundryman is unable to diagnose the trouble and prevent it from happening again. Most specifications give a liberal leeway to cover variations in test bars and allow a second bar to be pulled should the first one fail. Actual cases investigated.

14-158. Mold Surface Properties at Elevated Temperatures. H. W. Dietert, R. L. Doelman, and R. W. Bennett. American Foundrymen's Association Preprint No. 44-24, April '44, 19 pp.

Tests performed to obtain information concerning the elevated temperature properties of mold surfaces, such as spalling, confined expansion, hot strength, and hot deformation. Data obtained from these tests are presented graphically.

14-159. Considerations in Casting and Coining Malleable Iron. C. C. Lawson. American Foundrymen's Association Preprint No. 44-26, April '44, 5 pp.

The use of "coining" to produce malleable iron castings having a dimensional accuracy equal to that of machined surfaces. "Coining" refers to the application of pressure to opposite surfaces of a casting to control the dimension between the pressed surfaces.

14-160. Better Quality Aluminum and Magnesium Castings for Aircraft. Robert E. Ward. American Foundrymen's Association Preprint No. 44-27, April '44, 7 pp.

Necessity of producing light metal aircraft castings of the quality and in the quantity demanded by the present emergency. Close coordination of the work of designers, engineers and foundrymen is given as the fundamental essential in high quality casting production. A number of fundamental principles of casting design, with which the designing engineer should be familiar, are listed.

14-161. The Effect of Copper on the Properties of Cast Carbon - Molybdenum Steels. N. A. Ziegler and W. L. Meinhart. American Foundrymen's Association Preprint No. 44-28, April '44, 21 pp.

Results of studies of the effects of copper on the physical properties of carbon-molybdenum cast steels. Data obtained from the studies are shown in graphic and tabular form. 78 ref.

14-162. Mold Surface Back Gas Pressure. H. W. Dietert. R. L. Doelman, and R. W. Bennett. American Foundrymen's Association Preprint No. 44-34, April '44, 17 pp.

Hot permeability measurements, gas volume increase due to temperature, hot permeability test data, gas volume measurement, gas volume data, back pressure test data, mold gas flow.

Residual Stresses May Be Either Beneficial or Harmful, Almen Shows

Reported by Lawrence K. Jetter
Metallurgist, Aluminum Co. of America

Pittsburgh Chapter — Fourteen past chairmen, among them Past National Presidents W. H. Phillips and J. P. Gill, were guests of honor at dinner on March 9, when the Chapter celebrated its silver anniversary. The party was complete even to the traditional candle-lighted birthday cake.

The celebrants, including many of the founder members, heard C. M. Johnson and W. H. Phillips tell of the founding of the Chapter—how local groups of the Steel Treating Research Society and the American Steel Treaters' Society were formed on succeeding days with subsequent amalgamation into the American Society for Steel Treating. A. A. Bates, present chairman, traced the subsequent history of the Chapter.

J. O. Almen, head of the Mechanical Engineering Department, General Motors Research Laboratories, addressed the technical session on "The Effect of Residual Stresses on the Strength of Metals."

He pointed out that metal parts of similar composition and microstructure may differ widely in mechanical strength as a result of the presence of residual stresses. Accordingly, chemical analysis and metallographic examination often do not reveal the cause of failure or resistance to failure of a part.

By means of stress diagrams, Mr. Almen showed that residual stresses may be either harmful or beneficial depending upon their nature, distribution, and magnitude, and cited many actual cases of their influence.

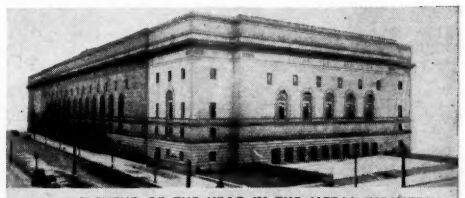
Fatigue failure, for instance, is initiated at surfaces stressed in tension. If compressive stresses are induced in such surfaces by peening, rolling, quenching, or nitriding, the effective tensile stress is reduced by the amount of the compressive pre-stress, and the fatigue resistance of the surface layer is thereby greatly increased.

In thin specimens the degree to which a surface can be advantageously pre-stressed in compression is limited by the magnitude of the tensile pre-stress that the sub-surface layers will support without fracturing.

It is a rare occasion when the subject of fatigue failure does not elicit interesting discussion among metallurgists and this meeting was no exception. Leader of the discussion was Howard Scott, metallurgical engineer, Westinghouse Research Laboratories.

Named General Manager & Chief Engineer

ROGER F. WAINDLE, formerly chief of tank and automotive production for the War Department, Chicago Ordnance District, has been released to the Alloy Casting Co. of Champaign, Ill., manufacturers and engineers of furnace mechanisms and heat resisting alloy castings, to become general manager and chief engineer.



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Metal Literature Review

14. FOUNDRY PRACTICE (*cont.*)

14-163. Cupola Raw Materials. H. W. Gillett. American Foundrymen's Association Preprint No. 44-30, April '44, 15 pp.

Coke varies and there is no unanimity how to specify it or test it for its effect on the final product; pig irons have heredity but there is no method to evaluate the differences; unpedigreed scrap or chips and turnings are so prepared as to be unsuitable for use much of the time; humidity of both pig iron and cast iron is controllable but there is no record of the value of this control. Control methods are taking some of the guesswork out of cupola practice.

14-164. Centrifugal Casting of Steel. C. K. Donoho. American Foundrymen's Association Preprint No. 44-32, April '44, 17 pp.

Various methods and types of centrifugal casting of steel. Advantages and disadvantages of centrifugal casting, as evaluated by comparison with static casting and forging, discussed in detail. Physical properties of steel cast centrifugally under various conditions given. The effects of various treatments on the structure and properties of centrifugally cast steel. Emphasis placed on deoxidation procedure. 8 ref.

14-165. Spinning Speeds of Centrifugal Casting Machines. F. G. Carrington. American Foundrymen's Association Preprint, No. 44-33, April '44, 14 pp.

Spinning speed, or revolutions per unit time, for a centrifugal mold is determined by direct effect of centrifugal force together with the force of gravity, the shape of the casting, details of machine design, and metallurgical characteristics. The fundamental differences of all these factors prevent their combined effects being determined except by experiment. Much data have been published on the spinning speeds used for castings, but to correlate such data, all the factors determining the speed must be taken into consideration. The purpose of this paper is to enumerate these factors and their individual effects.

14-166. Reproducibility of Elevated Temperature Sand Test Results. John A. Rassenfoss. American Foundrymen's Association Preprint No. 44-29, April '44, 22 pp.

Study to determine the accuracy with which elevated temperature compression strength results can be reproduced at a single laboratory and between different plant laboratories. Five different sand mixes were made in triplicate at a single laboratory and tested at 2500°F. The results obtained for single batches in a series deviated from the average of the three batches made per series by 15% or less. Similar elevated temperature tests performed by four different plant laboratories on specimens from the same mixes were erratic. Furnaces were adjusted so that the maximum temperature gradient through the specimen heating zones was 21°F. and the maximum variation between the average temperatures in the specimen heating zones was 25°F. Inter-laboratory check tests made after these adjustments were much more consistent.

14-167. Risering of Steel Castings. John W. Juppenlatz. *Metals & Alloys*, v. 19, April '44, pp. 874-879. 5 ref.

A new practice for the manufacture of sounder steel castings with considerable reduction in waste metal known as "atmospheric pressure feeding," involves the use of blind risers and some means such as graphite rods inserted in the latter for keeping the risers open to the atmosphere during solidification. This article explains the principle involved, the use of graphite rods and demonstrates how this practice localizes the shrinkage cavity and improves the general quality of steel castings. 5 ref.

14-168. The Hows and Whys of Centrifugal Casting. Harold B. Zuehlike. *American Foundrymen's Association Transactions*, v. 51, June '44, pp. 733-802.

Basic engineering formulas, mold materials, measuring the quantity of metal to be poured, the condition of the metal at the time of pouring, and special procedures for casting larger type castings centrifugally. Advantages of centrifugal casting, the structures obtained in such castings, and the relative cost as compared with sand molding. 15 ref.

14-169. A Report on the use of Aluminum in 10,000 Acid Electric Heats of Steel. E. C. Troy. *American Foundrymen's Association Transactions*, v. 51, June '44, pp. 803-820.

Application of 0.10 to 0.15% aluminum addition to acid electric steel for castings in green sand. Melting practice and methods of adding aluminum are explained. Effects of aluminum additions on the casting properties of the steel are covered, and physical properties experienced are tabulated.

14-170. Some Fundamental Relations Within the Cupola. William Pennington. *American Foundrymen's Association Transactions*, v. 51, June '44, pp. 980-1055.

By a careful analysis of the factors involved in cupola melting, certain equations have been evolved by means of which the melting conditions within the cupola may be ascertained. Chemical reactions involved in the burning of fuel in a cupola. Relation of carbon gases from the fuel as a means by which the melting behavior of the cupola may be ascertained.

14-171. Southern Bentonite in the Steel Foundry. N. J. Dunbeck. *American Foundrymen's Association Transactions*, v. 51, June '44, pp. 929-934.

Southern bentonite, intelligently used, can be of real help to steel foundrymen in the following ways: It gives definitely higher flowability, it gives easier shakeout, it gives greater freedom from hot cracks and tears due to sand.

14-172. Elevated Temperature Studies of Foundry Cores and Core Making Materials. Emile Pragoff and C. P. Albus. *American Foundrymen's Association Transactions*, v. 51, June '44, pp. 935-979.

Studies are presented on the hot strength, retained strength and expansion of two types of sand cores commonly used in foundry practice. These types are: (*a*) New sand cores, bonded with organic binders, no clay being present; (*b*) black sand cores, prepared from sands containing clay, bonded with organic binders. The conventional method of plotting hot strength curves, with data obtained at intervals of 500° F. is applied to both types of cores. The value of this method with each type core is discussed. 20 ref.

Secretary Eisenman Gets the Axe!

The Personalized Axe Presented to Gentleman Farmer and A.S.M. Secretary Eisenman by the Plumb Company.

Personalized Tasmanian Axe Is Unique Memento

A.S.M. National Secretary W. H. Eisenman was recently the recipient of a unique memento in the form of a personalized axe—the gift of C. P. Bascom, vice-president and manager of Fayette R. Plumb, Inc., and a past chairman of the St. Louis Chapter.

"The occasion," wrote Mr. Bascom in presenting the axe to Secretary Eisenman, "provided the opportunity to build into as prosaic an implement as even an axe a measure of sentiment that in later years may recall to your memory the esteem in which you are held by not only the members of our local chapter but by the entire national organization."

"For your particular implement," continued Mr. Bascom, "we have selected a Tasmanian Axe because it surrounds itself with something of wood lore and it is a pattern you will not run across in the States. . . . The acknowledged champion choppers of the world are the Australians. It is with them a national sport, like baseball with us, and it is not unusual to attract crowds of 50,000 to their axe carnivals.

"The chops are for cash prizes but for the carnival that carries with it the title of World's Championship, like the English Wimbledon in tennis, we have for the past several years given as a prize an axe like this one being sent to you . . .

"The axe is manufactured from a special steel, forged, ground and heat treated by special methods. The bit has been conditioned for fast chopping, ground down almost to racing thinness . . . A comparison with domestic patterns shows a marked difference but in my opinion nowhere on earth has the time and study been given to axe design that it has in Australia, and the results they get surely bear out this statement."

Paul C. Farren Heads Springfield Heat Treating Corp.

PAUL C. FARREN, a past chairman of the Springfield Chapter A.S.M. and at present a member of the Executive Committee and of the War Products Advisory Committee in Springfield, is now heading the staff of the Springfield Heat Treating Corp., Springfield, Mass.

For the past seven years Mr. Farren has been chief research metallurgist of the Greenfield Tap and Die Corp., and was for five years plant metallurgist for the General Electric Co. in Philadelphia. He is a graduate of Case School of Applied Science and is the author of many articles on heat treatment, the latest of which appeared in the October 1943 issue of *Metal Progress* on the subject of "High Speed Salt Bath Heat Treatment of Taps and Dies."

Revere Operates Six-Million-Dollar Magnesium Extrusion Plant

In a new $6,000,000 D. P. C. plant at Halethorpe, near Baltimore, to which a million dollar addition is already being added, Revere Copper and Brass has constructed and is now operating one of the largest magnesium extrusion plants in the country.

At the Halethorpe Extrusion Plant, casting shops for the production of magnesium in the form of sheets, strip, extruded tubes, rods, and shapes for a wide variety of uses are in production. A special laboratory has also been equipped and staffed by Revere for the purpose of conducting extensive research on the subject of magnesium and magnesium-alloys.

Manufacturers who would like information about the adaptability of magnesium to their needs, both wartime and postwar, are invited to address their inquiries to the Magnesium-Aluminum Division of Revere Copper and Brass Inc., Baltimore 27, Md.

Metal Literature Review

15. SECONDARY METALS

15-15. Many Problems Still Confront Scrap Metal Dealers Under the Price Control Program. Karl L. Anderson. *Metals*, v. 14, March '44, pp. 10-11, 13.

Ingot makers seen placed in marginal position because of raw material shrinkage; copper scrap scarcity serious.

15-16. Volume of Secondary, Scrap Metals Since the Start of War Shows Striking Increase. Thomas H. Miller. *Metals*, v. 14, March '44, pp. 14-15, 20.

Greatly increased volume of old scrap that will be an inevitable aftermath of the war suggests a greatly expanded secondary metals industry, and presents major problems in preparation and refining of contaminated scrap and in the development of new markets to absorb the increased output.

15-17. The Effect of Chrome Oxide in Basic Open Hearth Slags. C. R. Funk. *Blast Furnace & Steel Plant*, v. 32, April '44, pp. 448-454.

Greater percentages of chrome contaminated scrap can be used than heretofore thought possible, but to do so a more definite control of charging, melting, and furnace practice must be developed than is now being used in the majority of shops. A thorough knowledge of the slag is very essential both chemically and mineralogically. A thin section prepared from the type slags will soon show the characteristics of such slags, and with this data correlated to the floor samples a definite approach can be made to a more practical and useful furnace practice.

16. FURNACES AND FUELS

16-49. Cupola Lighting. *Iron & Steel*, v. 17, March '44, p. 296.

New range of torches using town or producer gas.

16-50. Pitch as an Open Hearth Fuel. J. F. Wilbur. *Iron & Steel Engineer*, v. 21, March '44, pp. 65-73, 77.

Properly handled, pitch makes an excellent fuel for open hearth furnaces. Tests show increased production, but at the expense of slightly higher heat requirement.

16-51. DPC Blast Furnace at Republic Cleveland. *Iron & Steel Engineer*, v. 21, March '44, pp. 85-87.

Description of plant.

16-52. Fuel Conservation Through Gas Burner Adjustment. E. R. Murphy. *Industrial Gas*, v. 22, April '44, pp. 17-18, 40.

Maintenance of correct industrial burner adjustment has been emphasized as a means toward obtaining uniform and efficient furnace performance and the furnace atmosphere most suitable to the heating process, consistent with performance efficiency. Maximum fuel efficiency of equal importance.

16-53. Metal Melting in Small Plants. A. H. Koch. *Industrial Gas*, v. 22, April '44, pp. 32, 39.

Tilting crucible furnaces, superheat pot furnaces.

16-54. Future of Liquid and Gas Fuels. Gustav Egloff. *Industry & Power*, v. 46, April '44, pp. 58-60.

Egloff believes that for a long time we will have sufficient petroleum for our essential needs in motor fuels and lubricants; that technical developments will probably minimize the production of residual oils that can be burned economically under boilers and other industrial equipment.

16-55. Induction Heating Advantages Warrant New Designing Techniques. Frank W. Curtis. *Product Engineering*, v. 15, April '44, pp. 242-245.

Economical, uniform heat applied rapidly to localized areas will tend to simplify manufacturing processes and contribute to improving products. Design modifications are often necessary to permit high frequency heating operations.

16-56. Gas Washing Developments. H. O. Johnson. *Blast Furnace & Steel Plant*, v. 32, April '44, pp. 46, 48, 50.

Description of washer, performance of washer, water requirement, condition of stoves, hearth construction—Donora blast furnace No. 1.

16-57. Automatic Calorific Value Control and the Volumetric Proportioning of Coal Gas. *Machinery (Lloyd)*, v. 16, March '44, pp. 47-49.

One of the simplest ways of producing gas of a constant calorific value is to dilute the rich gas coming from the retorts with a gas of lower calorific value, such as producer gas or bluewater gas. This can be done by controlling the diluent stream mechanically.

16-58. Relationships between Bath Volume, Hearth Volume and Electric Load in Electric Melting Furnaces. Victor Paschkis. *Industrial Heating*, v. 11, April '44, pp. 558, 560, 562, 592.

Relationships between bath volume, hearth volume and electric load in electric melting furnaces. Various phases of electric furnace design and operation.

17. REFRACTORIES AND FURNACE MATERIALS

17-15. The Selection of Blast-Furnace Refractories. Hobart M. Kraner and E. B. Snyder. *Metals Technology*, v. 11, April '44, Tech. Pub. 1727, 12 pp.

Volume stability, low porosity and decreased pyroplasticity are desirable for blast-furnace linings, particularly for the hearth. A hot load test is a valuable means of testing the fusion or softening behavior of a refractory at operating temperatures. The effect of carbon monoxide on commercial blast-furnace refractories in their as-received condition and after refiring is reported, showing that many commercial blast-furnace refractories disintegrate badly but that refiring decreases the effect and certain special refractories are now available which are almost free of the tendency.

17-16. Mycalex. Lawrence E. Barringer. *General Electric Review*, v. 47, April '44, pp. 53-55.

Mycalex insulation serves in a wide variety of applications; with the insulating advantages of ceramics, it is mechanically strong yet readily machinable; can be punched, compression molded, injection molded, or fabricated.

(Continued on page 10)

FOR INTERRUPTED QUENCHES

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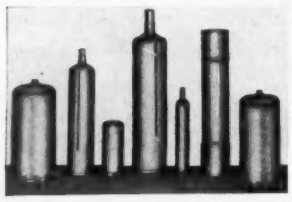

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Metal Literature Review

17. REFRACTORIES (*cont.*)

17-17. Production Results with a Basic Lined Cupola. C. Heiken. *Foundry Trade Journal*, v. 72, March 2, '44, pp. 185-187, 190.

High silicon losses, heavy lining deterioration, high carbon content.

17-18. Direct-Arc Electric Furnace Refractories. E. K. Pryor. *American Foundrymen's Association Transactions*, v. 51, June '44, pp. 878-896.

Various causes of refractory failures and shows the application of refractory products to direct-arc electric furnace practices. Properties of refractories and their relation to furnace operating conditions are discussed. Methods of furnace lining design and construction are presented. Necessity of proper design of door arches, jambs and roofs, and the selection of proper refractories for these points is particularly stressed. Performance of masonry type linings and monolithic linings of the sillimanite type are shown.

18. HEAT TREATMENT

18-74. The Pressure Quench for Armour Plate. Fred P. Peters. *Iron & Steel*, v. 17, March '44, pp. 207-310.

Removing distortion during hardening.

18-75. Heat Treatment of Large Steel Forgings in Controlled Atmospheres. O. E. Cullen. *Steel Processing*, v. 30, March '44, pp. 173-177.

Surface Combustion has installed a number of batch type furnaces equipped with gas-fired radiant tube heating elements for production heat treating of large forgings under careful atmosphere control.

18-76. Controlled Atmospheres for Bright Hardening. C. E. Peck. *Metals & Alloys*, v. 19, March '44, pp. 593-599.

Numerous atmospheres have been developed to prevent the scaling or decarburization of steel during heat treatment and thereby obviate subsequent expensive and time-consuming cleaning, pickling or grinding operations. Few have been successfully and broadly applicable to steels of widely varying carbon or alloy content or temperature conditions. The fields of use of some of the most useful varieties, with particular attention to separately prepared completely reacted fuel gas atmospheres. 2 ref.

18-77. What's Ahead in Heat Treating? *American Machinist*, v. 88, March 30, '44, pp. 83-92.

A preview of manufacturing techniques that will soon become common practice.

18-78. "X" Constitutent Formed in Alloy Steel on Continuous Cooling. Arthur R. Kommel. *Metal Progress*, v. 45, April '44, pp. 664-665.

C-Cr-Mo cast steel heat treated to simulate annealing and normalizing treatment.

18-79. Maximum Carbon in Carburized Cases. Floyd E. Harris. *Metal Progress*, v. 45, April, '44, pp. 683-686.

While extraordinarily high carbon films are sometimes found on carburized work, evidence is produced that this is an abnormal condition and that properly controlled furnace conditions give perfectly predictable carbons and carbon-penetrations.

18-80. Coupling Methods for Induction Heating. Wesley M. Roberds. *Electronic Industries*, v. 3, April '44, pp. 80-83, 174, 176, 178, 180, 182, 184, 186, 188, 190.

Design principles of output transformers and various types of energy applicators for special jobs.

18-81. Boron as an Accelerator of Malleable Annealing. Harry A. Schwartz. *Foundry*, v. 72, April '44, pp. 129, 182.

Effect of adding boron in amounts approximating 1% to white cast iron.

18-82. Hardening NE 8745 Steel. Donald E. Roda and Frank C. Brautigam. *Iron Age*, v. 153, April 6, '44, pp. 42-46.

NE 8745 steel hardens at a lower temperature than might be expected. Also, the correlation between the Rockwell hardness and microstructures is of general interest and shows that hardness values alone cannot be taken as an indication of complete hardening.

18-83. Gas Quenching. Wm. Lehrer. *Steel*, v. 114, April 10, '44, pp. 98-99, 134, 136, 138, 141.

Results produced by gas quenching SAE X-4130 are applicable to NE 8630 steel.

18-84. Sub-Zero Treatment of High Speed Steels. Stewart M. DePoy. *Iron Age*, v. 153, April 13, '44, pp. 52-55.

Important increases in tool life may be obtained regardless of how refrigeration is used, and if followed by a sufficient temper to relieve the tremendous internal strains caused by the process. It is believed that refrigeration of —100° F. or lower is necessary to produce marked change in high speed steel.

18-85. Decarburizing-Annealing in Carbon Monoxide Carbon Dioxide Mixtures. *Iron Age*, v. 153, April 13, '44, pp. 67.

Effect of wall thickness, annealing time and temperature, and gas composition, as well as that of the C content of the iron and the elements Mn, Ni, Cr, V and S, were studied.

18-86. Decarburization Control with Nitrogen Gas Atmosphere in Alloy Steel Annealing. Julius L. Kozma. *Wire & Wire Products*, v. 19, April '44, pp. 227-237, 262-264.

Use of nitrogen atmospheres for annealing high carbon and alloy rod and wire coils to hold decarburization to a minimum.

18-87. Nitriding Ferroalloys. Ralph H. and Dave Steinberg. *Metals & Alloys*, v. 19, April '44, p. 859.

Advantages of nitrogen-bearing ferrochromium for the production of high-nitrogen alloy or stainless steels. The authors, seeking a possible extension of this idea to alloying agents other than chromium, nitrided other ferroalloys and report the best temperatures and other conditions to use.

18-88. Interpretation of Isothermal Transformation Diagrams for Steel. *Industrial Heating*, v. 11, April '44, pp. 525-526, 528, 530, 532, 534, 536.

Describes how S-curves are developed, and their significance, and reproduces several of the curves.

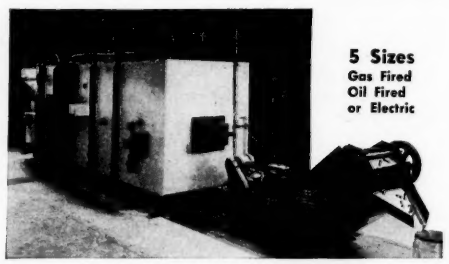
Director of Metallurgy For Crucible Steel Co. Dies

FREDERICK FLEMING MCINTOSH, 64, director of metallurgy, Crucible Steel Co. of America, died Feb. 23 at Sewickley, Pa., after a short illness. A member of the Pittsburgh Chapter A.S.M., Mr. McIntosh in 1905 received the first degree in metallurgy ever granted by Harvard University.

F. F. McIntosh

Shortly after graduation, he went to work for the Crucible Steel Co. of America at the LaBelle Works, and remained there for two years. Then followed two years at Bethlehem Steel Co. and ten years as assistant professor of metallurgy at Carnegie Institute of Technology in Pittsburgh.

After serving in World War I and attaining the rank of major, he returned to Carnegie Tech as associate professor of metallurgy and remained there until 1926, when he became chief metallurgist for Crucible. In 1939 he was named director of metallurgy.



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Mathes Cites Drawing Of 8x17-In. Magnesium Pot in One Operation

Reported by W. A. Mudge
The International Nickel Co., Inc.

New York Chapter celebrated its silver anniversary on April 10, with Chairman Harold M. Malm presiding in his usual happy manner. Following an excellent dinner, A.S.M. pins were awarded to five founder members who sat with Bill Eisenman 25 years ago in the McAlpin Hotel and planned for the Chapter; they were R. L. Angell, E. F. Cone, T. N. Holden, W. S. Rennie and Prof. Bradley Stoughton. Mr. Cone replied appropriately for the group and Professor Stoughton contributed a delightful page for the record of early reminiscences.

Chairman Malm then introduced 12 past chairmen and each received an A.S.M. pin as a gift from the Chapter. All the 23 sustaining members were presented with engraved certificates.

The speaker of the evening was J. C. Mathes, development engineer of the Dow Chemical Co., who described and illustrated, with slides and films, the manufacture, development and uses of magnesium.

Approximately 11 million lb. of magnesium alloys (exclusive of the alloy used for incendiary bombs) is used per month; 90% of this amount is in the form of castings.

With suitable hot-pressing equipment, sheet of the alloy containing 1.5% of manganese can be drawn easily and to many shapes. The high coefficient of expansion of the alloys necessitates compensation in the design of the steel dies used. An outstanding job was the drawing of an 8-in. diameter by 17-in. deep pot in a single operation.

Welding by the oxy-acetylene, heliarc and argonarc methods was illustrated and the use of suitable fluxes for gas welding was described. (No flux is used for arc welding.) Presses up to 5500 tons capacity are used for forging and extrusion.

The magnesium alloys offer excellent prospects for peacetime tonnage because of their high strength-weight ratio, and uses of the alloys for primary structures of aircraft are expected.

Attendance was the largest during the year; many lingered long after the formal closing of the meeting to ask questions.

W. R. Faithful Dies Suddenly at Office

WILLIAM ROBERT FAITHFUL, 66, former superintendent of the open-hearth department at the Central Iron and Steel Co., Harrisburg, Pa., died on April 11 at his office in the steel plant.

Mr. Faithful, a member of the York Chapter A.S.M., came to Harrisburg from the Carnegie-Illinois Steel Corp. in 1920, as assistant superintendent. He was named superintendent several months later and two years ago was transferred to the engineering department of the Central Iron and Steel Co.

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By Gordon T. Williams, Metallurgist
Deere & Co.

CONTENTS . . . Selection of Steels as Affected by Tensile Properties . . . As Affected by Endurance Limit . . . Impact and Hardness Tests; Notes on Their Practical Use . . . Wear, and What Can Be Done About It . . . Metallurgical Factors in Selection of Steels . . . Properties of Steel as Purchased . . . What Alloy Should Be Used . . . Utility of Case-hardening Steels . . . Considerations in Fabrication . . . Economics of Steel Selection . . . Problems and Service Failures.

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Metal Literature Review—*Continued*

18. HEAT TREATMENT (*cont.*)

18-89. A Study of Quenched Gray Cast Irons—Microstructure and Hardness. E. Jimeno and A. Modolell. *American Foundrymen's Association Transactions*, v. 51, June '44, pp. 897-925.

Hardening of steel has been studied and the following factors have been found to affect it: (1) Austenite composition, (2) amount, nature and distribution of insoluble particles in the austenite, (3) austenite grain size at the time of quenching, (4) size of specimen, and (5) the heat abstracting power of the quench. 8 ref.

18-90. Sub-Zero Stabilizing of Steel Gages and Parts. Harold A. Knight. *Metals & Alloys*, v. 19, March '44, pp. 610-614.

The stabilization of precision gages and machine parts is a cold-treating application which has recently received new prominence and a sharp expansion in use. These have come about through the development of mechanical refrigerators that go down to—150°F. Methods used to "season" gages and parts via sub-zero treatment.

18-91. Yes—Deepfreezing Helps. A. S. Eves. *Modern Machine Shop*, v. 16, April '44, pp. 162, 164, 166, 168, 170.

Some of the phenomena that have resulted from this treatment.

19. WORKING

Rolling, Drawing, Pressing, Forging

19-72. Operating Economy of Pneumatic and Steam Forging Hammers. F. Knorr. *Engineers' Digest*, v. 1, March '44, pp. 211-213.

Performance and operation.

19-73. Planned Grain Flow in Forgings. Waldemar Naujoks. *Metals & Alloys*, v. 19, March '44, pp. 590-592.

Explanation of the origin and development of the flow lines or fibre structure to which forgings owe so much of their high strength and serviceability. Stresses the importance of designing the part and planning the forging operation so that optimum positioning of the grain flow will result.

19-74. Processing Parts from Strip Steel in Progressive Dies. C. W. Hinman. *Steel Processing*, v. 30, March '44, pp. 162-164.

Layout of the die blocks and punches for a three-station progressive die that produces the channel clip.

19-75. Dies for Drop Forging. E. W. Mace. *Steel Processing*, v. 30, March '44, pp. 154-155.

Multi-impression drop forging dies.

19-76. Stretch-Forming Double-Curved Sheet-Metal Parts. R. B. Glassco and N. O. Myklestad. *Steel Processing*, v. 30, March '44, pp. 168-171, 177-178.

(See No. 19-91.)

19-77. Popularity of Forged Aircraft Parts. H. L. Showalter. *Aero Digest*, v. 44, March 1, '44, pp. 127, 129, 199.

Advantages of forging; properties of impact die forgings.

19-78. The Two-Jaw Chuck Applied to Drop Forgings. "S." *Machinery* (London), v. 64, March 9, '44, pp. 269-270.

Adaptability of the two-jaw chuck for holding safely and accurately drop forgings of irregular form.

19-79. Designing of "Trouble-Free" Dies. C. W. Hinman. *Modern Industrial Press*, v. 6, March-April, '44, pp. 24-26.

Design for a progressive die; principles of design and construction; feeding progressive dies.

19-80. Cold Roll Forming Machines. George Kentis. *Modern Industrial Press*, v. 6, March-April '44, pp. 28, 30.

Cold roll forming of beads and sharp corners.

19-81. Relative Scopes of Hydro-Press Forming with the Master Rubber Pad. Gordon B. Ashmead. *Modern Industrial Press*, v. 6, March-April '44, pp. 45-48.

The Guerin Process.

19-82. A Pipe Bending Success Story. G. E. Healy and D. M. Johnston. *Industrial Gas*, v. 22, April '44, pp. 19, 41-42.

Pipe, 4 in. in diameter and over, receives what is known as "hot bends," while smaller pipe, on extra-short-radius bends, is filled with resin to prevent flattening and is bent cold. Larger radius bends require no filling. Gas heat is used even in the cold short-radius bends.

19-83. Production Problems of Exhaust Collector Rings. Eric O. Johnson. *Automotive Industries*, v. 90, April 1, '44, pp. 24-27, 56.

How to adapt extensive mass production equipment for die-pressing and deep-drawing such pre-war articles as refrigerator cabinets, kitchen sinks and certain automobile body parts to the production of collector rings.

19-84. Cold Reduced Strip Steel. Paul J. McKimm. *Steel*, v. 114, April 3, '44, pp. 132-134, 170.

Slight roughness on surface of strip affords the use of higher annealing temperatures, reduces friction in forming operation and improves adhesion of coatings. Changes in physical characteristics of low carbon steel as a result of cold rolling and type of heat treatment employed to restore values.

19-85. Methods for Forming Sheet Aluminum. *Aviation*, v. 43, April '44, pp. 150-152, 276.

Manufacturing processes and formulas used by one of America's leading industrialists.

19-86. Stretch-Bend Unit Simplifies Metal Work. J. S. Nielson and C. B. Mitchell. *Aviation*, v. 43, April '44, pp. 155, 253, 255.

New machine saves manpower and lowers costs in forming strips, extrusions, and bent-up sections.

19-87. The Drawing of Synthetic Fibers. S. Coppick. *Wire & Wire Products*, v. 31, April '44, pp. 238-241, 253.

Drawing synthetic fibers. Analogies between the fiber and wire drawing industries. Both of these industries are faced with the same problem, i.e. the unidirectional extension of matter.

(Continued on page 12)

19-88. Upset Forging on a Welder. D. B. Wilkin. *Steel*, v. 114, April 17, '44, pp. 94-97, 100, 102.

New process now being employed by Cleveland Pneumatic Tool Co. in making trunnion pins for aircraft landing gears. Production costs are reduced 56%.

19-89. Eastern Wire-Strip Mill Now in Production. *Steel*, v. 114, April 17, '44, pp. 116-118, 142.

Round and shaped steel wire and strip products weekly produced at American Steel & Wire Co., Worcester, Mass. Machinery, equipment and processing facilities are designed so that the highest quality production of steel and wire products is effected. Engineering and operating plans have allowed for the addition of auxiliary and supplementary equipment to keep pace with the future research and development in the various phases of steel production.

19-90. Reclaiming 75-Mm. A. P. Shot by Forging. Charles C. Barrenbrugge. *Iron Age*, v. 153, April 13, '44, pp. 71-73.

75-mm. M72 solid shot made into the more deadly 75-mm. M61 carrying an explosive charge. Re-forging made it possible to convert this shot without waste of material and eliminated many machining operations.

19-91. Analysis of Stretch-Forming Double-Curved Sheet-Metal Parts. R. B. Glassco and N. O. Myklestad. American Society of Mechanical Engineers *Transactions*, v. 66, April '44, pp. 161-168.

Double-curved surfaces are classified according to direction of curvature. A qualitative stress analysis is made of stretch-forming (process of clamping metal sheet at two opposite edges and forcing a punch into the taut sheet) each class of surface, with special reference to the stress transverse to the direction of restraint. It is shown that there are two distinctly different sources of transverse stress during stretching.

19-92. Bending Preformed and Extruded Sheet-Metal Sections. Thomas T. Tobin. *Machinery*, v. 50, April '44, pp. 139-145.

Use of wrap-forming and cam-bending machines to give proper contours to airplane structural members of extruded and preformed shapes.

19-93. How to Secure Fine Surface by Grinding. XI H. J. Wills and H. J. Ingram. *Machinery*, v. 50, April '44, pp. 159-161.

Machine lapping operations.

19-94. Rolling Alloy Steels in Canada on Combination 26 and 22-In. Mills. R. G. Drinnan. *Blast Furnace & Steel Plant*, v. 32, April '44, pp. 443-447.

The 2-high 26-in. reversing mill, the 3-high morgan 22-in. mill, advantages of the combination mills, general plant layout and equipment.

20. MACHINING AND MACHINE TOOLS

20-116. Special Chuck for Internal Grinding Machines. E. Boneham. *Machinery (London)*, v. 64, Feb. 17, '44, pp. 181-182.

Self-centering chuck described and illustrated.

20-117. Cutting Oils. T. R. Kidd. *Machinery (London)*, v. 6, Feb. 17, '44, pp. 182-183.

Research on cutting fluids, water-soluble oils, neat cutting oils.

20-118. Production Milling. *Automobile Engineer*, v. 34, March '44, pp. 102-106.

Application of this process to repetition manufacture.

20-119. Seven-Spindle Horizontal Automatic for Machining Large Work-Pieces. E. Dornhöfer. *Engineers' Digest*, v. 1, March '44, pp. 209-211.

Construction of a horizontal machine with seven radially arranged spindles, in which six tool slides are embodied, the seventh headstock and spindle being used for chucking operations. The spindles are carried in seven identical headstocks fixed on a round rotatable table, the latter in turn resting on a base bolted to the foundation. Each tool slide likewise forms, with its bed and drive, an integral unit bolted to the foundation.

20-120. Gear Grinding. *Engineers' Digest*, v. 1, March '44, pp. 246-247.

Helical gear grinding, lead measurement, spline shaft grinding.

20-121. Surface Finish. W. E. R. Clay. *Institution of Automobile Engineers Journal*, v. 12, March '44, pp. 8-23.

Diamond and carbide-tipped tool turning, boring, and milling; reaming; broaching of bores (for finish); polishing; rolling; scraping; grinding; honing; superfinishing; lapping.

20-122. Roll-Turning Lathe. *Iron & Steel*, v. 17, March '44, pp. 295-296.

Heavy duty machine for rolls up to 30 in. diameter.

20-123. Production of Mountings for 90-Mm. Anti-Aircraft Guns. *Machinery (London)*, v. 64, March 2, '44, pp. 231-235.

Machining as carried out by the General Motors Corp.

20-124. Universal Screw Threads. Harry F. Atkins. *Machinery (London)*, v. 64, March 2, '44, pp. 241-243.

Form, pitch, limits.

20-125. Machining Armour-Piercing Shot. H. L. H. *Machinery (London)*, v. 64, March 9, '44, pp. 253-257.

Operations on vertical automatics.

20-126. Machining Set-Ups for Valve Guide. "U." *Machinery (London)*, v. 64, March 9, '44, pp. 265.

Methods for production of stop valves and costs kept in estimated figures.

20-127. Advanced Techniques Solve Machining Problems. *Aero Digest*, v. 44, March 15, '44, pp. 102, 104.

Precision parts for airplane engines. All parts are of a critical nature, with close tolerances and complicated structures. Machined from forgings; correction after heat treatment; external thread ground.

20-128. Multiple Cutting of Tubing. *Iron Age*, v. 153, March 30, '44, p. 45.

Use of a plain wooden block, cut in the shape of a V, bound, on the sides by a piece of canvas and topped off with a snap fastener, has speeded up tube cutting.

20-129. Hobbing Speeds Production of Bullet Dies. John Zubell. *American Machinist*, v. 88, March 30, '44, pp. 93-96.

Dies hobbed to eliminate contour machining and grinding must be lapped between rough and finish hobbing operations to remove all tool marks. Tungsten dies can be resized to compensate for wear.

Post Current Heat Treats Spot Welds in Steel

Reported by E. W. Husemann
Metallurgist, Copperweld Steel Co.

Warren Chapter—At a well-attended meeting on March 13 Wendell F. Hess of Rensselaer Polytechnic Institute spoke before a joint meeting with the Youngstown Chapter of the American Welding Society on "The Spot Welding of Hardenable Steels."

Because of the rapid cooling of spot welds from the austenitic range, by virtue of the contacting copper alloy electrodes, all but the lowest carbon steels are hardened and therefore are brittle in the as-welded condition. A post current, applied after welding, serves to temper the spot weld, thereby increasing the tensile strength normal to the axis of the weld and the impact strength as well as decreasing the hardness across the weld.

Special current and timing controls are necessary to accomplish this. Close control of the cooling time between welding and tempering is necessary in order that hardening may be complete before tempering is started. This off-time is a function of the carbon content, the higher carbon steels requiring more time for complete hardening. The tempering current must also be kept low enough to avoid rehardening.

Dr. Hess confined the majority of his remarks to stock sizes under ⅛ in. Above this maximum thickness more complicated heat treatments are necessary, since the coarse cast structure of the weld must be refined before tempering is resorted to.

The ability to heat treat a steel spot weld without removing it from the welder greatly widens the field of resistance welding of ferrous alloys, since desirable properties can be imparted to all types of hardenable steels.

After the technical meeting a short plant visitation was held at the Taylor-Winfield Corp., where members and guests obtained some information on the building and operation of resistance welding machines.

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Dr. Grossmann's Heat Treatment Talk Enthusiastically Received at Los Angeles

Reported by James B. Morey
International Nickel Co., Inc.

Los Angeles Chapter—National Officers' Night, March 23rd, in spite of banquet and transportation limitations, brought out nearly a record number of men and women from all Southern California industry at Scully's Cafe. Certainly this was due to the prospect of again meeting our genial national secretary, Bill Eisenman, and hearing President Grossmann's talk on the "Principles of Heat Treatment."

Chairman Joe Burgard opened the evening by introducing several past chairmen.

For clarity and conciseness Dr. Grossmann's presentation of the "Principles of Heat Treatment" could hardly be excelled. Preceding his talk, Bill Eisenman prefaced a concise but full report on A.S.M.'s national activities and condition with reminiscences and anecdotes on his Ohio "country gentleman farm."

Employment Service Bureau

Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, Ohio, unless otherwise stated. Applicants for the positions listed below are required to observe the rules and regulations of the War Manpower Commission regarding a Statement of Availability, if employed in an essential activity.

Positions Open

SKILLED OR UNSKILLED MEN: Old established firm making and machining steel castings for over 35 years offers splendid opportunity in steel foundries and machine shops, located in Ohio. Should be over draft age or not subject to induction. Needed in all departments including melting (electric furnace), molding, heat treating, roll department, cleaning room, pattern shop, and laboratory. Also supervisors for all departments. Write or apply to The Ohio Steel Foundry Co., Lima, Ohio or Springfield, Ohio.

MECHANICAL ENGINEERS: To fill important vacancies in Planning Branch, Production Division, Chicago Chemical Warfare Procurement District. Bachelor's or Master's degree in mechanical engineering, or five to ten years' experience. To interpret blueprints, specifications and drawings, to estimate production capacity and plan production schedules. A knowledge of controlled materials plan and procedures desirable. Salary $3200 to $5600. Address War Department, Chicago Chemical Warfare Procurement District, Room 1600, Civic Opera Bldg., Chicago, Ill.

INDUSTRIAL FURNACE DESIGNER: Electric furnace experience preferable but not necessary. Experience on mechanical handling and quenching equipment of particular value. Generous pension plan. All details education, experience, salary and photograph first letter. Ajax Electric Co., Inc., Frankford Ave. at Delaware Ave., Philadelphia 23, Pa.

ENGINEER-METALLURGIST: Experience in welding and fabrication of light metals and steel, to do development work for large container manufacturer. East. Give details of experience. Box 5-5.

PERSONNEL ASSISTANT: With engineering and industrial psychology training for a middle west research organization. Would assist in interviewing, carrying on general correspondence and looking after selective service. Salary open. Box 5-10.

NON-FERROUS PHYSICAL METALLURGIST: Location middle west research institute. Salary open. Box 5-15.

METALLOGRAPHER: Thoroughly skilled in steel, gray iron, non-ferrous, aluminum and magnesium, with recognized standing, to do custom work on percentage basis with well-known metallurgical consulting firm. Prefer one with some modern equipment and a following. Box 5-25.

MANAGER: Man capable of managing a metal powder laboratory, to conduct research, development and technical control of raw materials and final products. State previous experience and training. Box 5-30.

METALLURGICAL CHEMIST: Familiar with both ferrous and non-ferrous analysis. Also some experience in plating solution control. Knowledge of shop control and materials desirable. The Amertorp Corp., 7500 W. Roosevelt Rd., Forest Park, Ill.

GRADUATE ENGINEER: To serve as plant manager in modern, fully equipped permanent mold foundry. Trained and experienced in aluminum permanent mold casting. Should have metallurgical engineering in addition to practical experience. Middle West. Box 5-75.

FERROUS METALLURGIST: Experienced in melting operations. Location middle west research institute. Salary open. Box 5-20.

SALES REPRESENTATIVES: Already established, but in a position to handle further sales work. Nationally known firm manufacturing steel treating materials and cold glue polishing cement. Basic knowledge of heat treating and clientele desired. Box 5-80.

SALES REPRESENTATIVES AND JOBBERS: For nationally known manufacturer of precision tensile testing machines; experienced. Write giving complete record of products now handled, qualifications, and other details. Widely advertised line; permanent connection. Box 88.

Positions Wanted

METALLURGIST: 14 years' diversified ferrous experience in various supervisory capacities. Well versed in physical metallurgy, metallography, all phases of heat treatment, physical testing and X-ray diffraction. Desires responsible metallurgical position. Box 5-35.

METALLURGIST: Desires high caliber post-war continuing position involving materials study, application and control. Fifteen years' laboratory and shop supervisory experience; exceptional foundry experience. Capacity for complete supervision medium sized metallurgical department. Midwest. Box 5-40.

METALLURGIST: Ph.D., electrochemical background, interested in responsible and permanent position in research, development, or teaching. Twelve years' experience and good fundamental background in ferrous and non-ferrous field, physical metallurgy, coatings for metals, and testing. Box 5-45.

METALLURGIST: Seventeen years' experience in steel manufacture and uses, research, development; carbon, alloy, stainless steels. Ph.D. midwestern university. Now available. Box 5-50.

METALLURGICAL CHEMIST: Experience in non-ferrous foundry practice, heat treatment, all phases of laboratory, including radiography, spectroscopy, and foundry sand control; also experience in non-ferrous smelting. Will take position anywhere, but prefer west coast or South America. Draft classification 4-F. Box 5-55.

METALLURGIST: B.S. degree, 25 years' experience automotive industry. Thorough knowledge heat treating, physical testing, specification writing, metallography and chemistry. Would like to head chemical-metallurgical department. Experience in investigating production metallurgical problems. Available at once. Prefer midwest. Box 5-60.

GRADUATE METALLURGIST: Recent, Case, B. S. in Metallurgical Engineering, age 22. Desires position eventually leading to sales engineering or production work. Army medical discharge does not limit capacity as a civilian. Box 5-65.

METALLURGIST: Graduate, eight years' experience in both production and research. Good knowledge of metallography, physical testing, heat treating, machining and tool steels. Experienced in production of steel and brass; familiar with fabrication of automotive parts, refrigerators, aircraft, stokers, drawings and stampings. Box 5-70.

Metal Literature Review

20. MACHINING (*cont.*)

20-130. Slidefilms Form Basis for Shop Training. Lyne S. Metcalfe. *American Machinist*, v. 88, March 30, '44, p. 97.

Use of slidefilms to teach fundamental practices in machine tool and other metal-working operations saves as much as 40% of the time generally needed to train production workers.

20-131. Practical Ideas. *American Machinist*, v. 88, March 30, '44, pp. 107-112.

Compound die for sheet-steel punchings. Fixture indexes round stock for milling squares. Small-hole gage has micrometer thimble. Press tools set grommets in braided wire. B. & O. designs new engine-house vise bench. Redesigned casting simplifies drilling oil holes. Micrometer readings corrected by second index line. Plug gages made from drill rod. Tool drives Riv-Nuts in close quarters.

20-132. Ground Spherical Fits Reduce Manufacturing Time. J. R. Miller. *American Machinist*, v. 88, March 30, '44, pp. 100-103.

Interchangeability of parts achieved by elimination of lapping to fit mating concave and convex bearing surfaces on 90-mm. anti-aircraft gun unit.

20-133. Tooling the Automatic Screw Machine, X. Noel Brindle. *Modern Machine Shop*, v. 16, April '44, pp. 196, 198, 200, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228.

Thread rolling, skiving, and shaving operations, and design of tools for performing these operations.

20-134. Deflections and Chatter in Machine Tools. George E. Hieber. *Product Engineering*, v. 15, April '44, pp. 269-271.

Bending and torsional deflections in machine tools and the importance of calculating their accumulated effects as a procedure in design for the purpose of reducing vibrations or chatter and improving machine tool performance. Fundamental principles reviewed and applied to a few typical designs of bed, headstock and gearbox.

20-135. Unusual Jobs on the Horizontal Boring Mill. E. E. Wagner and George R. Holt. *Tool Engineer*, v. 13, April '44, pp. 67-70.

The horizontal boring, drilling, and milling machine's wide adaptability may offer an economical and time-saving solution to your shop headaches. Several examples of smart tooling with this equipment are described here.

20-136. Milling With Fly Cutters. Ralph R. Weddell. *Tool Engineer*, v. 13, April '44, pp. 85-89.

Are fly cutters a compromise with present-day equipment? An expert reveals the relation of number of teeth in the cutter to the work, the fixture and available horsepower.

20-137. High Production Honing Without Fixtures. A. F. Hasty. *Tool Engineer*, v. 13, April '44, pp. 93-94.

Honing is a machine operation which supplements grinding, boring, reaming and broaching. It is used to generate roundness and to produce surface finishes as fine as one micro-inch.

20-138. 388-Punch Piercing Die. *Steel*, v. 114, April 3, '44, pp. 126, 129.

Pierces 976 holes in ten different parts with an accuracy of 5/10,000ths of an inch at speed 30 times that of former methods.

20-139. Precision Fixtures. H. V. Wenger. *Steel*, v. 114, April 10, '44, pp. 102-103, 152-153.

Reduce machining problems, cut costs 35%.

20-140. Broaching Speeds Output of Airplane Brake Shoe Parts. *Steel*, v. 114, April 10, '44, p. 112.

Broaching process removes rapidly large amounts of stock and at the same time obtains extreme accuracy with high production.

20-141. The Future of the Machine Tool Industry. Max Leach. *Iron Age*, v. 153, April 13, '44, pp. 56-59.

Future of the industry in the next decade depends largely upon the policy adopted by government in the disposal of surplus machine tools.

20-142. Gooseneck Carbide Tools. Gaylord G. Thompson. *Iron Age*, v. 153, April 13, '44, pp. 68-70.

Running counter to the accepted practice that carbide tools must be clamped solid for efficient cutting of metal, the author advocates the use of carbide tools with gooseneck shanks to absorb the shock present on interrupted cuts. Two forms of gooseneck tool holders that proved successful on a specific job.

20-143. Contour Control Device Uses Air Gage Principle. *Iron Age*, v. 153, April 20, '44, pp. 85, 174.

Contour control which employs the principle of the precision air measuring gage to obtain high accuracy in the automatic operation of machine tools.

20-144. Grinding to Ten-Thousandths Inch on a High-Production Basis. Ralph Price. *Machinery*, v. 50, April '44, pp. 154-155.

Methods and equipment used for high-production grinding of work that is held to size within tenths of a thousandth of an inch.

20-145. Care and Use of Thread-Cutting Dies. M. B. Henneberger. *Machinery*, v. 50, April '44, pp. 166-169.

Recommended practice in maintenance and application of thread-cutting dies with tangential type chasers.

20-146. Obtaining Sensitivity with Air-Hydraulic System. F. A. Barnes and C. Johnson. *Machine Design*, v. 16, April, '44, pp. 155-158.

Combination of pneumatics and hydraulics to provide extreme sensitivity in the contour-turning unit. Utilizing a thin metal templet as a master, the unit controls turning, boring and facing operations automatically within 0.0002 in.

20-147. Drilling Angularly Related Holes. C. W. Hinman. *Tool & Die Journal*, v. 10, April '44, pp. 96-100.

Jig cradles, drilling angular holes without cradles, tooling conditions for drilling angular holes, speeds for individual drills in a group, multiple drilling heads.

20-148. Swarf in Grinding Machine Coolants. *Machinery (Lloyd)*, v. 16, March '44, p. 43.

"Churchill" patented swarf separator consists of a circular tank in which the effluent from the grinding machine flows across a sloping trough and thence down a tilted spout which causes the liquid to take a circular motion and deposit the swarf on the outer perimeter of the tank.

26 Types of Wires Now Being Used for Metallizing Process

Reported by Charles Nagler
University of Minnesota

North West chapter—Martin Stesin, metallizing engineer, introduced his subject at the March meeting by tracing the historical development of metallizing from the early experiments of Dr. Schoop in Zurich, Switzerland, up to the work being done today by the Metallizing Engineering Corp.

A total of 26 different types of wires are being metallized at the present time, including zinc, lead, stainless steel, low carbon and high carbon steel. The wires are fed through the metallizing gun by an air turbine and the metal is melted by the oxy-acetylene flame and blown out onto a prepared surface.

In the operation of the gun, the moisture from the air must be removed to prevent excessive oxidation of the fine particles of metal being sprayed. In the operation of the torch, a neutral flame is desired; a working pressure of 15 to 17 psi. of oxygen and acetylene is used. The air pressure in the gun is between 60 and 65 psi.

The speaker named four important features of metallizing; (*a*) There is only a mechanical bond between the sprayed metal and the base metal; (*b*) no melting of the base metal takes place; (*c*) the surface to be metallized must be roughened, cleaned and thoroughly dried; (*d*) the metallized surface is porous and homogeneous.

Limitations on metallized parts are: (*a*) Low tensile strength, (*b*) low shear strength, and (*c*) low impact strength. One outstanding feature of metallizing is that successive coatings of various metals can be built up one on top of another with good mechanical bond between the layers.

The metallizing industry is playing an important role in the war effort in the reclamation of worn surfaces on rotating parts, with tremendous savings of both time and money in placing machines back into operation. One large important war use of metallizing is the spraying of aircraft cylinders with aluminum to improve corrosion resistance. Parts on the Liberty ships are metallized to prevent excessive corrosion and the locks on the Panama Canal are metallized for the same reason. Mr. Stesin illustrated his talk with a goodly number of interesting slides and actual metallized parts.

Chapter Awards Stimulate High School Metallurgy

First of the newly created John F. Wyzalek Memorial Awards of the New Jersey Chapter will be presented at the regular meeting on May 15, according to Chairman C. W. Hasemann. The awards are part of the Chapter's plan for stimulating metallurgy and heat treating courses in New Jersey's technical and vocational high schools.

The first awards, two $50 prizes, will go to outstanding students taking specified heat treating courses in the schools in the Newark area. Other New Jersey schools are taking steps to expand their courses in heat treating and metallurgy so their students may be eligible for prizes in the future.

In naming the awards for the late Mr. Wyzalek, the Chapter is honoring one of its charter members who died in 1942. He was chief metallurgist at the Hyatt plant and an outstanding national authority on metallurgy and heat treatment.

The 1944 project is the identification of steels by the spark test. Another award this year will go to the student in Bayonne Vocational Technical High School who most ably completes the project of case hardening a lathe mandrel.

"These awards are designed to promote the metallurgical education of practically trained young men about to enter industry," Hasemann explained. "The plan has been worked out in cooperation with leading educators and certain minimum hours of heat treating work in classrooms, shops and laboratories will be uniformly applied."

At the present time, all schools meeting the requirements or which are taking positive steps to adjust their curricula to meet them receive membership in the American Society for Metals.

Heading the committee which planned and is supervising the wards is Dr. Alfred Bornemann of Stevens Institute of Technology. On the committee are Mr. Hasemann, A. M. McWilliams, R. J. Allen, C. J. Weigel, Edward L. Zapp, James H. Heath, W. C. Schulte and H. J. Mullin.

Metal Literature Review

20. MACHINING (*cont.*)

20-149. Drummon Maxicut Lathes. *Machinery (Lloyd)*, v. 16, March '44, pp. 44-45.
Drummond Maxicut lathe has been specially designed for turning and finning aero engine cylinders and has been stripped of all unnecessary mechanisms which, for the present, are not required and would only detract from the simplicity of the machine. The lathe is capable of machining the concentric and eccentric fins of radial aero engine cylinders at an extremely high rate of output.

20-150. Thread Milling Cutters. *Machinery (Lloyd)*, v. 16, March '44, pp. 46-47.
Thread milling is a development of form milling and the shape of the threads cut depends upon the accuracy and precision of the machine as well as that of the cutter.

21. CLEANING AND FINISHING

21-40. Suggestions for Selection of Buffing Wheels. Gerald A. Lux. *Metal Finishing*, v. 42, April 44, pp. 203-207.
Materials used in buffing wheels, full disc buffs, sewed full disc buffs, applications of various full disc buff sewings, spiral sewing, concentric sewing, square sewing, special sewings, sewed pieced buffs, special construction buffs.

21-41. Coatings for Steel Cartridge Cases. R. A. Brenneck and R. L. Norum. *Metal Finishing*, v. 42, April '44, pp. 245-247.
Cleaning shells, dip application, baking procedure, spray application.

21-42. Some Timely Pointers on Metal Finishing. F. R. Boynton. *Industrial Finishing*, v. 20, March '44, pp. 50, 52, 54, 59.
Diversified finishing and finishing materials. Prime coat; adhesion and permeability. Some things that counteract adhesion. Technique of correct spraying. Sanding surfacer; knifing putty. When your enamel doesn't dry properly. Wrinkle finish and how to use it.

21-43. Postwar Indications. R. J. Fairburn. *Industrial Finishing*, v. 20, March, '44, pp. 60, 62.
Changes that are being planned in product finishing; what they mean to you, your organization, your customers and your future competition.

21-44. "Near Infrared" Cuts Bake-Dry-Preheat Time. Paul H. Krupp. *Aviation*, v. 43, April '44, pp. 153-154, 239-240.
Requiring only minutes where hours once were needed, this heat-job process is saving thousands of war-time man-hours.

21-45. Cleaning Small, Delicate Parts. Martin Steinhardt. *Steel*, v. 114, April 17, '44, pp. 120, 123.
Accomplished mechanically and at high speed.

21-46. Operation and Possibilities of Gas Pickling of J. J. Turin. *Iron Age*, v. 153, April 20, '44, pp. 64-70.
This process has many characteristics making it readily adaptable to continuous electrogalvanizing and electrotinning lines. It obviates the necessity for disposal of spent pickling liquors. Operation is described. Photomicrographs shown to indicate the type of surface condition obtained.

21-47. Survey of Methods for Cleaning Metals. J. M. Bialosky. *Industrial Finishing*, v. 20, March '44, pp. 41-42, 44, 46, 48.
Solvent cleaning; degreasing self-emulsifying compounds; alkali cleaners; care of power washers; removal of scale by blast cleaning, by pickling and by different burn-off methods.

21-48. Electronic Heat Dries Paint Coatings. *Industrial Finishing*, v. 20, April '44, pp. 36, 38, 40, 42.
Induction heating, with high frequency electricity—which heats metal surfaces quickly, to dry paint coatings.

21-49. Intelligent Selection of Finishing Equipment. W. Beacham. *Industrial Finishing*, v. 20, April '44, pp. 60, 62, 64.
Buying for now or present or future, lack of foresight . . . idle machines later, more production wanted.

21-50. Postwar Metal Cleaning. Carl L. Jensen. *Industrial Finishing*, v. 20, April '44, pp. 66, 68, 70, 72.
A quick glance over different methods of cleaning surfaces of metal before painting. This will have to be considered in your postwar production plans.

22. WELDING, BRAZING AND FLAME CUTTING

22-141. Some Notes on the Welding of Non-Ferrous Metals. N. P. Inglis. *Metallurgia*, v. 29, Feb. '44, pp. 214-216.
The technical application of metals and alloys depends to an appreciable extent on their ability to be satisfactorily welded. The use of welding and of welded structures has now become so established that welding methods are invariably considered in the choice of a material. Some of the main features associated with the welding of non-ferrous metals. 9 ref.

22-142. Tank Top Welding Repairs. J. K. Johannesen. *Welding*, v. 12, Feb. '44, pp. 99-105.
1,135 ft. of welding repairs to a cargo ship damaged by grounding.

22-143. Building up High Speed Tool Steel. E. Denz. *Welding*, v. 12, Feb. '44, pp. 106-107, 118.
Methods used to overcome the shortage of high speed tool steel and emergency methods to repair cutting tools. 5 ref.

22-144. Aluminum-Treated Steels. William Bull. *Welding*, v. 12, Feb. '44, p. 109.
Research on their weldability.

22-145. Welding Contraction. *Welding*, v. 12, Feb. '44, pp. 110-112.
Distortion and "locked-up" stresses.

22-146. Fusion Welded Drums and Pressure Vessels. S. H. Griffiths. *Welding*, v. 12, Feb. '44, pp. 122-126.
Welding processes of joining the edges of rolled or pressed plates.

(Continued on page 15)

Hardness Relationships in Tempering Shown

Reported by Paul F. Ulmer
Metallurgist, Link Belt Co.

Indianapolis Chapter—Following a custom of several years' standing, in which a member of the home chapter presents a discussion of some phase of metallurgy which is of general interest, A. E. Focke, research metallurgist of Diamond Chain & Mfg. Co., explained some recent concepts of "Tempering."

Dr. Focke began by illustrating that the reduction of hardness of quenched steel is not dependent on temperature alone, but also on time. Some steels soften as much when held for considerable time (1000 hr.) as when given the conventional tempering time (½ to 1 hr.) at temperatures as much as 200° F. higher. Hardness does not always decrease uniformly as the temperature is increased but may actually increase in some temperature ranges.

To explain these irregularities in the hardness-time-temperature surfaces, Dr. Focke reviewed the evidence obtained from the microscope and the X-ray. In order to demonstrate the effects of tempering by simultaneous measurements of the changes in length and in the intensity of magnetization, he had made a short animated cartoon.

To associate these changes in hardness with other physical properties, the variations in the impact-time-temperature curves were discussed. The speaker was in accord with theories expressed by other investigators that this "blue brittle" phenomenon might result from the change in the decomposition products of the martensite from the "transition structure" to the normal iron carbide rather than from the decomposition of the retained austenite alone.

Two interesting observations were made: First, that the increase in impact strength resulting when test pieces made from steel subject to "temper brittleness" are quenched from the draw may be offset by the stresses introduced in parts so treated; and the other, not generally recognized by the practical man, that a part quenched to full hardness (martensite) will temper to lower hardness more rapidly than one which is not full hardened by the quench.

Abstracts of Foreign Patents Ready

A project for publishing abstracts of 7000 foreign-owned United States chemical patents which have been seized by the Alien Property Custodian, and are now being licensed to American manufacturers, has been completed, according to announcement by the Office of the Alien Property Custodian. These "Abstracts of Chemical Patents" have been prepared in cooperation with the Chicago Section of the American Chemical Society and the Science-Technology Group of the Special Libraries Association.

They are classified in 25 sections, section 10 having to do with metals and alloys. The price is $1.00 per section or $25 for a complete set of 33 sections. Orders should be addressed to the Office of Alien Property Custodian, Chicago 3, Ill.

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NEW PRODUCTS IN REVIEW

KENNAMILLS—INSERTED-BLADE CUTTERS

Kennametal, Inc., 502 Lloyd Avenue, Latrobe, Pa.

A line of inserted-blade cutters, known as Kennamills, for step-milling of steel, is announced by this company. These new cutters are available in four sizes: 2-in. with 3 blades; 3-in., 4-in., and 5-in., each with 4 blades. The 2-in. and 3-in. sizes have taper shanks to fit No. 40 and No. 50 spindles; the 4-in. and 5-in. sizes have taper shanks to fit No. 50 spindle only. All sizes use the same standard replaceable Kennametal - tipped blades. Two sets of blades are supplied with each cutter head. Immediate delivery can be made from stock.

Kennamills are said to permit high speed carbide milling of steel with the same smoothness of operation attained with multiple blade cutters, yet they are as simple to maintain as fly cutters. Tool and cutter grinders are not necessary, it is said, since the blades may be removed from the cutter head and resharpened to a template on a simple adjustable table carbide grinder. Accurate resetting in the head is not necessary as each blade cuts an independent path. New Kennamills are a distinct advancement in fly-cutter milling technique, since on cuts of over ¼ in. depth the horsepower available on modern milling machines can be fully utilized. Work is distributed among the greater number of blades, special sizes can be made. Free sample available.

Mention R220 When Writing or Using Reader Service

PLASTIC ENVELOPE

American Plastic Products,
3974 W. 6th St., Los Angeles 5, Calif.

Made of cellulose acetate plastic, a Kleer-Vu envelope has been designed as a protective covering for work orders, blue prints, maps, charts, diagrams and other factory forms. Envelope keeps the card or record form clean and visible. Bound leatherette edges on all sides prevent the envelope from tearing or breaking. Envelope is flameproof, moisture-proof, oil-proof. Size is 10 x 12½ in., but sizes can be made to suit special needs. Free sample is available.

Mention R221 When Writing or Using Reader Service

METAL CLEANING EQUIPMENT

Tivit Products Co., Los Angeles, Calif.

This company has been established as a manufacturer of equipment for metal processing and cleaning. Tivet is now manufacturing tanks, steam pressure cleaners, portable pressure spray tanks, and a number of specialized units, including: Bench-size Tanks and Spray Booth for small parts cleaning; Portable Radiator Flushers; Steam Syphon Guns; and an automatic feeding injector hook-up known as the Tivit Economy Steam Cleaner. In addition to these standard lines, Tivet builds tanks to specifications and maintains a field engineering service in designing, layout, construction and installation of solution tanks and other equipment for metal processing and industrial chemical operations.

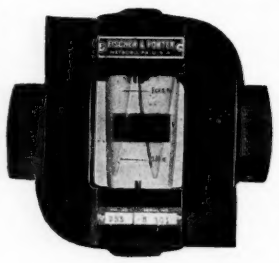
Mention R222 When Writing or Using Reader Service

ROTA-SIGHT FLOW RATE ALARM

Fischer & Porter Co., 9135 County Line Rd., Hatboro, Pa.

For visible and audible protection against dangerously low or high flows of liquids and gases, this company has developed new Rota-Sight Flow Rate Alarm. Valuable and critical equipment that can be ruined by failure of a cooling or lubricating flow, or a process or product that could be spoiled by excessive flows may be safeguarded with this positive new device.

This alarm operates through a float which moves up and down a pyrex tube into which triangular flutes have been fashioned. As the float rises, the area within the flutes increases, causing the float to assume a position in the tube in direct proportion to the flow rate. A magnetic extension on the float trips an external switch to operate the alarm circuit. The alarm flow point is adjustable over the entire flow range and is designed to operate accurately at the set position.



This alarm is said to be especially valuable as a low flow alarm in cooling water lines to Ignitron tubes used in electronic equipment such as high-frequency welding equipment. It is also used for flows of water, lubricating oils, filter feeds, overflows, chemical additives, etc. It is built in sizes up to 2½ in. and may be obtained in any corrosion resistant metal that can be cast. Bulletin 92-B gives full details.

Mention R223 When Writing or Using Reader Service

NEW CONTROL INSTRUMENTS

Harrison & Peoria Sts., Chicago 7, Ill.

A line of instruments to enforce any desired heating or cooling program has been announced by this company. Named Chronotrols, the instruments are built around the company's line of pyrometers and other instruments, all of which employ an electronic principle of effecting temperature control. They provide completely automatic temperature regulation, regardless of the changes in temperature desired for a given process or application. Temperature cycle is cut on a disc, and its rotation by a synchronous motor moves the temperature setting lever of the control instrument. Chronotrols are offered in 25 models, including ten for proportioning control and others for two-position on-off and three-position on-intermediate-off control for high and low temperature applications. Thermometer models are available in recording as well as indicating types.

Mention R224 When Writing or Using Reader Service

IRON CEMENT

So-Lo Works, Loveland, Ohio

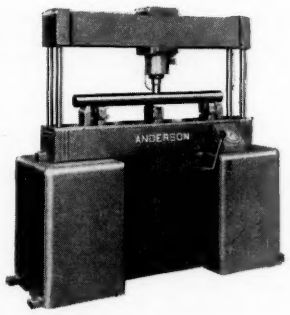
"Fix-Iron" is said to be unusually effective for repairing broken, cracked, or defective metal castings, making joints, seams and loose parts secure; and stopping leaks in boilers, furnaces, fire-pots and other metal equipment, according to this company, producers of a line of industrial cements and adhesives. "Fix-Iron" is in powder form, to be mixed with water as used. No heat is required. May be applied with putty knife or similar tool and hammered into cracked or broken parts. After metallizing, it possesses the same expansion and contraction properties as iron itself, assuring a permanently tight joint regardless of temperature changes.

Mention R225 When Writing or Using Reader Service

POWER PRESS WITH TRAVELING RAM

Anderson Bros. Mfg. Co.,
1907 Kishwaukee St., Rockford, Ill.

A new power press with a traveling ram is announced by this company as especially adaptable for straightening cam shafts. Instead of moving the anvils, centers, and work, the ram is moved along on ball bearings.



The base and hydraulic unit are the same as used on the Anderson Model HP-010-P. The unit has a 10-ton capacity and plans are now being made for a 25-ton press. It is believed automobile and airplane plants will be especially interested in this new type of press.

Mention R226 When Writing or Using Reader Service

NEW PORTABLE HOT WAX DIP TANKS

Aeroil Burner Co., Inc., West New York, N. J.

To answer the increasing demand for a wider variety of hot wax dip tanks to meet Army-Navy Specifications for packaging for overseas shipment, this company has developed two new electrically heated, portable additions to their current equipment in this field. The first, Twin Waxmaster, was engineered to meet the needs of those who are wax dipping and, in addition, require facilities for heating wax for spray lines. This portable electrically heated unit features two hot wax dip compartments in one tank. First compartment may be used for melting wax for spraying. Individual thermostats in each insulated compartment permit positive temperature control from 100 to 550° F.

The second new hot wax dip tank, Waxmaster Senior, is a larger adaptation of the portable, electrically heated junior model that has found acceptance in industrial and governmental protective coating work. This Senior tank offers a dipping space of 25x9¾ in. and will, it is said, safely heat and melt up to 24 lb. of solid wax in 50 min. without discoloration or scorching. New bulletin describes complete range of hot wax dipping equipment.

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More New Products on Pages 15, 16, *and* 18

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Metal Literature Review—*Continued*

22. WELDING (*cont.*)

22-147. Heavy-Gage Spot Welding. *Engineers' Digest,* v. 1, March '44, pp. 247-248.
Resistance welding of light alloys of heavier gage than those in common use.

22-148. Strength of Arc Welded Seams. H. Cornelius and F. Bollenrath. *Engineers' Digest,* v. 1, March '44, pp. 249-251.
The properties of butt welds produced by metallic arc welding of high strength, heat-treated steel sheets of 3, 4 and 6 mm. thickness.

22-149. Oxygen and Acetylene for Welding and Cutting. *Steel Processing,* v. 30, March '44, pp. 156-158.
Sources. Oxygen cylinders; manifolds, calcium carbide and acetylene; acetylene from carbide; classes of generators.

22-150. Resistance Welding. Kenneth Rose. *Metals & Alloys,* v. 19, March '44, pp. 604-607.
Pre-cleaning, weld finishing, weld testing, etc.—on which depend the production of first-class welds in all materials resistance welded.

22-151. Design of Spot Welded Aluminum Alloy Aircraft Structures. Albert Epstein and H. O. Klinke. *Aero Digest,* v. 44, March 1, '44, pp. 121-123, 125, 194, 196, 199.
Testing spots for strength; sheets crack from oil canning; single-spot vs. single-rivet joints; comparative deflection important; protection against corrosion; strength of spot welded splices.

22-152. Aluminum Welding at Willow Run. Stanley H. Brams. *Iron Age,* v. 153, March 30, '44, pp. 46-50.
Ford is an advocate of spot welding aluminum sheet wherever feasible. Placing emphasis on proper cleaning and regular electrode maintenance, the Bomber Plant has worked all-purpose cleaning solutions and an electrode dressing device that help maintain high weld quality above the minimum AAF shear values. Refrigerated tips are not favored.

22-153. Strip Mill Butt-Flash Welding. *Iron Age,* v. 153, March 30, '44, pp. 56-58.
Design improvements incorporated in an 80-in. butt-flash welder for installation in a hot rolled strip line, feeding a continuous pickling line and a cold reducing mill for tin plate.

22-154. Metallic Arc Welding Electrodes. Harold Lawrence. *Steel,* v. 114, April 3, '44, pp. 136, 139, 140, 158.
Virtues and shortcoming of E6013 rods.

22-155. Safeguarding From Faulty Welding in Installing Alloy Steel Liners. *National Petroleum News,* v. 36, April 5, '44, pp. R-193-R-194.
Strip weld method developed by metallurgical engineer prescribes technique which facilitates good workmanship.

22-156. Metallic Arc Welding Electrodes. Harold Lawrence. *Steel,* v. 114, April 10, '44, pp. 104, 106, 148-151.
Class E6020 and 6030 unalloyed electrodes.

22-157. Welded Hand Truck Simplifies Product Handling. *Iron Age,* v. 153, April 13, '44, p. 59.
Designing and welding of a simple three-wheeled hand truck for handling welding machines in the shipping department.

22-158. Flash-Butt Welding. J. H. Cooper, J. J. Riley and J. C. Barrett. *Iron Age,* v. 153, April 13, '44, pp. 60-65.
Basic information for producing quality welds.

22-159. Helium-Shielded Arc Welding of Magnesium F. A. Wassell. *Western Metals,* v. 2, April '44, pp. 21-24.
Welding power, helium, mechanics of welding, illustrations, joint preparation, backing plates, strength of magnesium alloy butt joints.

22-160. Basic Principles of Joint Design for Machine Welding. R. F. Wyer. *Industry & Welding,* v. 17, April '44, pp. 27-28, 68, 71-72, 74-77.
To obtain the maximum efficiency and production from automatic welding equipment proper joint design is the first prerequisite.

22-161. Procedure in the Oxy-Acetylene Welding of PT Boat Engine Cylinder Water Jackets. R. C. Van Deventer. *Industry & Welding,* v. 17, April '44, pp. 29-33.
In order to obtain satisfactory quality and uniformity it was found necessary to control all details of the entire fabrication to an unusual degree. Also, a mechanical form of stress relief was developed which removed the stresses normally left as the result of welding.

22-162. Welding Speeds Fabrication of Diesel-Engine Crankcases and Marine Gear Cases. C. U. Hansen. *Industry & Welding,* v. 17, April '44, pp. 50-51, 54.
The maximum allowable deviation from standard is 1/16 in. in the over-all dimensions of the crankcase assemblies and ⅛ in. in the gear cases. Welds are inspected by the Magnaflux method.

22-163. Why Stress Relieve? A. E. Bedell and J. B. Quigley. *Welding Engineer,* v. 29, April '44, pp. 35-39.
When and where to stress relieve and helpful hints on the proper methods and temperatures.

22-164. Flame-Cutting Square Turrets. H. F. Berg. *Welding Engineer,* v. 29, April '44, pp. 40-44.
A machine tool maker selects machine flame-cutting as a means of reducing machining cost. This choice results in a $35 saving on each square turret tool post.

22-165. The Welding Engineer—What's His Job? Walter J. Brooking. *Welding Engineer,* v. 29, April '44, pp. 42-44.
Evaluating welding electrodes, testing and re-testing, testing weldors, training new weldors, correlating plant departments, fixtures for welding.

22-166. Finding the Best Welding Speeds. Joseph Schuman Wright. *Welding Engineer,* v. 29, April '44, pp. 48-49.
A middle speed is best to avoid warping on butt-welded bars.

22-167. Welded Tanks for Penicillin. Clyde B. Clason. *Welding Engineer,* v. 29, April '44, p. 50.
Quantity production of new high-powered bacteria killer.

22-168. Metallic Arc Welding Electrodes. *Steel,* v. 114, April 17, '44, pp. 106, 124, 138, 140, 142.
Class E7010 electrodes.

22-169. Flash-Butt Welding. J. H. Cooper, J. J. Riley and J. C. Barrett. *Iron Age,* v. 153, April 20, '44, pp. 79-84.
Good and poor designing practice and recommendations which are predicated on creating balanced sections in the vicinity of the weld.

22-170. Construction and Application of a Welded Jig. Harold F. Wahl. *Machinery,* v. 50, April '44, pp. 156-158.
Description of a boring jig constructed by arc welding.

22-171. Tool Tipping by Arc Welding. George W. Given. *Metals & Alloys,* v. 19, April '44, pp. 856-858.
The conservation benefits and operating economies derived from the use of tipped tools, in which hardened high speed steel tips are affixed to ordinary steel shanks, are being increasingly enjoyed. Arc welding for this purpose has generally been avoided but arc welding with a suitable electrode can be both simple and satisfactory.

22-172. Training Welders and Supervisors. M. Q. Cellers. *Steel,* v. 114, April 24, '44, pp. 92-93, 146, 148, 150.
Lessons learned in training men for fabrication of ships on a large scale likely to prove useful to industry in establishing or improving existing production procedures.

22-173. Metallic Arc Welding Electrodes. Harold Lawrence. *Steel,* v. 114, April 24, '44, pp. 114, 134, 137, 138, 140, 142, 144.
Characteristics of class E7020 type.

22-174. Welding in Production. Vin Zeluff. *Scientific American,* v. 170, April '44, pp. 157-159.
Electronic control methods have increased reliability and speed in welding. Bringing precision operations to the assembly line. Factors governing quality of welds can be held automatically within predetermined limits. Magnesium now welded electrically.

22-175. Elimination of Overhead Welding. *Aero Digest,* v. 45, April 1, '44, pp. 74, 126.
Overhead welding must be eliminated to as great a degree as possible, for it is slow and difficult as compared with flat welding. Jigs can be so designed as practically to do away with this position in welding.

22-176. Design of Spot Welded Aluminum Alloy Aircraft Structures. Albert Epstein and H. O. Klinke. *Aero Digest,* v. 45, April 1, '44, pp. 94, 96, 98, 120, 122.
Spot spacing, tension and peeling forces, load per spot at flange 200 lb.

23. INDUSTRIAL USES AND APPLICATIONS

23-107. Chain Cables. T. Scott Glover. *Welding,* v. 12, Feb. '44, pp. 91-98.
Manufacture of chain cable up to the present time and the importance of welding in this industry. 3 ref.

23-108. The Production of the Sten Gun. *Machinery (London),* v. 64, Feb. 17, '44, pp. 169-173.
Press-tool operations on the magazine.

23-109. Manufacture of Steel Cartridge Cases. *Machinery (London),* v. 64, Feb. 17, '44, pp.175- 180.
Duties which determine the required properties of material, necessity for checking material, stripping arrangement, trimming prior to final draw, the "detearing" unit.

23-110. Post-War Prospects for the Machine-Tool Industry. *Machinery (London),*v. 64, Feb. 17, '44, pp. 191-192.
How to deal with surplus machines, and post-war prospects.

23-111. Fabrication of Bofors Top Carriage Gun Table at Midland Steel Products Company. W. N. Robinson. *Steel Processing,* v. 30, March '44, pp. 147-153.
Forming the bearing ring; blanking, heating and forming base; furnace for heating base discs; welding bearing ring to base; fabrication of housing; bearing; stress relieving furnace; description of furnace; operation of furnace; temperature cycle.

23-112. Shipbuilding and Light Alloys. E. C. Goldsworthy. *Engineers' Digest,* v. 1, March '44, pp. 242-245.
Value of weight savings, non-structural applications, machinery—main and auxiliary, research. 7 ref.

23-113. Chain and Chain Repairs. F. W. Shaw. *Iron & Steel Engineer,* v. 21, March '44, pp. 44-52.
Chains should receive the same care given any high grade piece of equipment. Most failures are due to abuse or to lack of proper inspection and repairs.

23-114. Sten Gun Manufacture. *Machinery (London),* v. 64, March 2, '44, pp. 225-229.
Production of ejectors, back sights and barrel seats.

23-115. Tool Design and Improvisation. O. H. P. *Machinery (London),* v. 64, March 2, '44, p. 237.
How time factor dominates aero-engine industry.

23-116. The Design and Care of Ball Bearings. *Machinery (Lloyd),* v. 16, March 4, '44, pp. 46-48.
Failure can generally be traced to causes which may be grouped under the following headings: Drawing office, workshop, operating or lubrication faults. Each is briefly discussed.

23-117. Light Alloys After the War. *Chemical Age,* v. 50, March 4, '44, pp. 231-232.
Development of markets in Britain.

23-118. The Economical Use of High-Speed Steel. James Farmer. *Machinery (London),* v. 64, March 9, '44, pp. 259-262.
How to make the best use of stocks, and what to do with tools that have become too short. Economical length of tool. British high speed steels, the correct use of the various grades.

23-119. A Unique Silver and Steel Stamping Assembly. J. Walter Gulliksen. *Modern Industrial Press,* v. 6, March-April, '44, pp. 18-20, 22.
Development of steel piston pin plugs drawn from sheet steel and replacing plugs machined from solid aluminum rod, used in the ends of the piston pins of aircraft engines.

23-120. The Antiquity of Tools. Joseph Danforth Little. *Metal Finishing,* v. 42, April '44, pp. 208-209, 233.
History of the drill, saw and chisel.

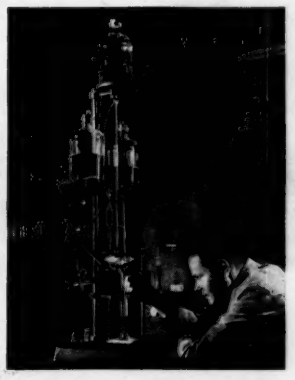
(Continued on page 17)

NEW PRODUCTS

3-MINUTE SULPHUR DETERMINATOR

The Harry W. Dietert Co.,
9330 Roselawn Ave., Detroit 4, Mich.

An improved 3-minute sulphur determinator for rapid and accurate work on all steel, iron, and non-ferrous metals, and materials such as coal and coke, is announced by this company. The sample is ignited in a high temperature furnace in an oxygen atmosphere. The sulphur in the sample is converted to sulphur dioxide gas. It is filtered free of all dust particles by a hot ceramic filter within the furnace combustion tube. The sulphur dioxide gas then bubbles through an alkaline solution and reduces its alkalinity. The greater the sulphur content in the sample, the lower the alkalinity of the solution. The alkalinity of the solution is measured by titrating with a standard acid solution.



The improved sulphur determinator is now divided into two units. The measuring burettes with 2-liter solution bottles are mounted on one unit. The other unit consists of a stand and support for holding the solution vessel at the furnace. This arrangement increases the speed with which sulphur determination may be made, since one sample may be in the process of combustion while another sample is in the process of titration. The sulphur percentage is read direct from the burette scale.

The gas bubbler is separated from the solution vessel allowing these parts to be of inexpensive construction and easy to clean. The large solution bottles hold ample amounts of prepared solutions and may be quickly removed for refilling.

Mention R228 When Writing or Using Reader Service

RUST PREVENTIVE CUTTING COOLANT

Machinery Supplies Co.,
501 Madison Ave., New York 22, N. Y.

Rust prevention can now be obtained automatically during the ordinary working procedure on metal parts without additional labor, according to this company. This new product is added to clear water and water soluble cooling-cutting oil, and works while the various operations are performed. The quantity of the rust preventive ingredient is only ⅛% of the whole solution and the percentage of water soluble cutting oil amounts to between 1 and 3% on an average, depending on the material to be worked upon. Compared to other cooling-cutting oil solutions, this is said to mean a saving of about 60% or more oil, all the working time for greasing the finished parts and wiping them. The liquid dries by itself, forming a tight but invisible film which fills up the finest pores of the metal surface without affecting the measurable height.

Trade name of the ingredient is Ru-Pre-Sol. Illustrated is a piece of steel in water with ⅛% Ru-Pre-Sol after six months. Descriptive literature is available.

Mention R229 When Writing or Using Reader Service

CLEANING AFTER MAGNAFLUX

Technical Processes Div., Colonial Alloys Co.,
Philadelphia 34, Pa.

A simple dip or spraying of metal work with Cyclodiene Hydrocarbon Solvent is said to remove oil and dye, and leave clean metal surfaces. Cyclodiene can be handled in ordinary open tanks or spray machines at room temperature. Toxicity is said to be negligible. Since Cyclodiene is tested neutral, and shows no signs of hydrochloric, muriatic, oxalic, nitric or sulphuric acids, or cyanides, it is safe to use with all metals including aluminum and magnesium. Solvent recovery rate is very high, so that the solutions may be used over and over again. Magnafluxed parts thus cleaned are soon ready for such operations in surface finishing as rust proofing, painting or other organic finishing, electroplating or anodizing.

Mention R230 When Writing or Using Reader Service

More New Products on Pages **16** *and* **18**

NEW PRODUCTS IN REVIEW

NEW REFRACTORY COATING

Neo Mold Company, 2183 E. 18th St., Cleveland, Ohio.

A new refractory coating, applicable to foundry and heat treating fixtures, to prolong their life under intense heat, has been developed by this company, known as "Neo-Kote-P 101". Typical applications are magnesium and aluminum melting pots, core baking boxes, loading racks for high temperature furnaces and heat treating fixtures of various types. It is said that the coating greatly increases the number of heats to which such equipment can be subjected before breaking down. In plants where pot and crucible equipment were scaling and breaking down under a maximum of 25 to 30 heats, this treatment has commonly increased the serviceability to 50 or 60 heats. It is not unusual for treated pots to last 75 to 90 heats.

Process lends itself to comparatively fast treatment of production equipment. Accessories to be protected need only be blast-cleaned, after which the treatment is completed by the Neo-Kote process. When the coating shows signs of deteriorating, it can be renewed if the fixture is taken out of service and retreated before the steel has started to scale. The coating is done only in Neo Mold's Cleveland plant.

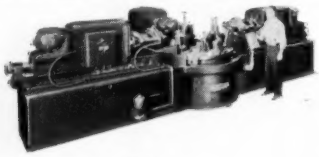
Mention R231 When Writing or Using Reader Service

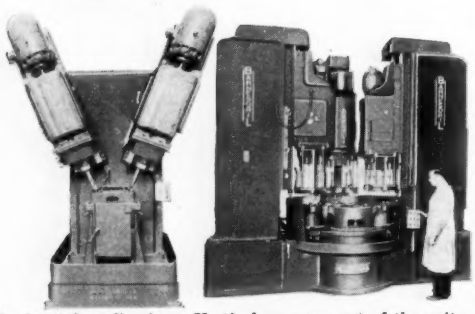
HYDRAULIC PRODUCTION DRILLING UNITS

Barnes Drill Co., 814-30 Chestnut St., Rockford, Ill.

Completion of a new special hydraulic production drilling unit is announced by this company. This unit can be arranged for drilling, reaming, facing, boring, counterboring or tapping operations in any one or combination use, and absence of any supply of Manila hempen rope able in three sizes, with a 5 to 7½-hp. motor, a 10 to 15-hp. motor, or a 20 to 25-hp. motor.

Used vertically as a hydraulic production machine, the unit is capable of performing simultaneous drilling, reaming and counterboring operations. These units can also be arranged vertically in combination with angular and





horizontal applications. Vertical arrangement of the units around a rotating indexing table will result in savings in machining and handling time by combining several operations.

The units can be arranged for horizontal operations either as single units grouped around an indexing table or in combination with vertical and angular applications. Each unit has a flange support for mounting interchangeable auxiliary heads of any desired number and arrangement of spindles. One standard unit, equipped with an 8-spindle auxiliary head and used horizontally as a self-oiling production machine, is capable of facing and counterboring as many as 8 bosses simultaneously.

The low cost, high production possibilities of these machines are said to be almost unlimited. They can be furnished suitably mounted on the proper columns, horizontal beds, supports, hydraulic indexing tables and other elements as a machine complete in itself. New 8-page bulletin gives full details.

Mention R232 When Writing or Using Reader Service

ANTI-CORROSION FILMS FOR STEEL

Glyco Products Co., Inc., 26 Court St., Brooklyn 2, N. Y.

Anti-corrosion films for steel can be obtained by the use of Sublan, it is said. Diluted with an equal amount of thin, acid-free mineral oil, Sublan was applied to highly polished steel surfaces and tested in a 90 to 95% relative humidity "wet saturated" with condensate forming continuously on the surface. The film thickness was that amount which adhered on cold dipping the panel and draining. After 1200 hr. there was no evidence of rust formation. Polished panels protected with Sublan and mineral oil mixture were stored wrapped in grade A paper for ten months and showed no rusting. Coating passed the tests against hydrobromic acid and salt water immersion and humidity conducted in accordance with Government Specification AXS 674. Furthermore the film is said to suppress latent fingerprints on the polished steel surfaces. Films are readily removed from the surface by cold solvent wash or dip.

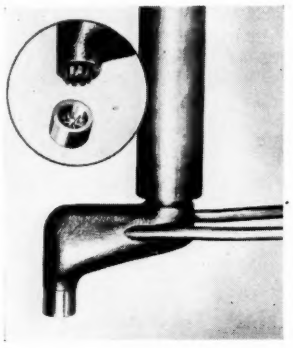
Mention R233 When Writing or Using Reader Service

OFFSET ELECTRODE PERMITS TIP COOLING

Frostrode Products, 19003 John R St., Detroit 3, Mich.

The first offset spot welding electrode which can be effectively cooled at its tip has been announced by this company. Large numbers are already being used in the fabrication of aircraft sub-assemblies.

Until the development of this offset electrode it was impossible to provide efficient electrode cooling, it is claimed, when spot welding in such hard-to-get-at positions as spots close to flanges, etc., since internal water passages could not be extended to the tip without dangerously weakening the "knee" which the offset type of electrode requires. Maximum strength in the Frostrode offset electrode is retained by having a "solid" cross-section at the point of greatest stress. The cooling liquid enters the Frostrode offset electrode below the knee and thence flows through the coolant guide into the finned, replaceable Frostcap which forms the electrode's tip. Function of the coolant guide is to concentrate the cooling action of the fluid where it will do the most good—at the very tip of the electrode. A controlled flow of the cooling medium circulates through the finned cap and then back through the flutes which have been machined into the outer diameter of the coolant guide and so on out of the electrode, below the knee.



Mention R234 When Writing or Using Reader Service

RIVNUT—INTERNALLY THREADED AND COUNTERBORED TUBULAR RIVET

The B. F. Goodrich Company, Akron, Ohio.

The patented Rivnut, originally developed by Goodrich engineers for aeronautical uses, is now available for a wide variety of industrial applications. Minimum priority requirement for industrial usage is AA-5.

The Rivnut is an internally threaded and counterbored tubular rivet which can be headed blind, made from one of the most corrosion resistant practical aluminum alloys. Of one-piece construction, the Rivnut is anodized and ready for use when received. By use of special tools, either manually or power operated, which Goodrich also distributes, the Rivnut can be pulled up or headed while working entirely from one side, forming a bulge or head on the far side. This upset is large enough to resist being pulled through the metal, plastics or hard rubber to which the Rivnut is applied.

Installed, it serves as a nut plate or rivet, or both. Two head styles, countersunk and flat, are offered, with the countersunk made in three shapes and the flat in one. Each is made in three nominal sizes, available in six grip ranges. They can be supplied with open or closed ends and with or without keys under the head in all styles except the thin head countersunk type, where the key cannot be supplied. Manufacturers of air-conditioning units, stoves, refrigerators, radios, panels, sheet metal articles, and electrical equipment, shipbuilders and telephone and telegraph systems can find excellent use for the Rivnut, according to Goodrich. Twelve-page descriptive folder is available.

Mention R235 When Writing or Using Reader Service

COOLING RESISTANCE SPOT WELDERS

Airtemp Div., Chrysler Corporation, Dayton, Ohio

An air cooled "packaged" 1½-hp. refrigeration unit, designed for cooling resistance spot welders and for other specialized industrial liquid cooling service, is announced by this company. The resistance welder cooling unit is completely self-contained and is said to have ample capacity to cool all types of spot welders, when handling aluminum or ferrous metals.

Tip cooling of spot welders makes it possible not only to increase the welding speed, but also reduces the amount of tip cleaning and dressing necessary in the average welding operation, it is said. When a continuous number of welds are made the tip temperature tends to get hotter and hotter; for this reason ample capacity is necessary in the refrigerating mechanism to keep the tips at the desired temperature. This cooling unit has a counter-flow liquid cooler mounted in the base. An insulated storage tank is equipped with a special ¾ hp. pump having a nominal capacity of 6 GPM. Location of the liquid cooling unit in the base eliminates losses of the coolant employed at the time of changing tips, as all liquid drains back to the storage tank. A pressure regulating valve assures flow of coolant at a constant pressure.

Mention R236 When Writing or Using Reader Service

TRUSHADE PROCESS OF GOLD PLATING

The Alrose Chemical Co., Providence, R. I.

Developed by Alrose chemists after 20 or more years of scientific and practical research, the Trushade Process introduces an industrial gold finish that can be applied quickly and economically.

The process consists of Trushade 24-kt. gold and Trushade hard and 14-kt. alloys. Former is metallic gold suspended in an aqueous medium for use in preparing 24-kt. and alloy plating solution. The latter are alloy metals also suspended in an aqueous medium and are for use in conjunction with Trushade 24-kt. gold in preparing alloy plating solutions.

Trushade is said to eliminate the loss incurred in cutting down gold, and its efficiency is said to be far higher than prepared salts such as gold chloride and gold cyanide. This process also allows a greater flexibility of application in gold plating operations.

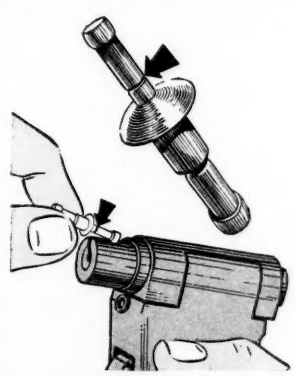
Mention R237 When Writing or Using Reader Service

NOTCH FEATURE IMPROVES BLIND RIVETS

Cherry Rivet Co., Los Angeles 13, Calif.

Cherry blind rivets are now being supplied with an important new feature, with the addition of a notch in the pulling mandril of the self-plugging type rivet providing several important advantages.

This notch serves to inhibit the flow of the metal in the upsetting process employed in forming the pulling head. As a result, Cherry rivets are now more uniform. Another important advantage is that a shorter mandril is required, thus effecting a saving in material as well as providing for a shorter drawbolt movement, making possible the use of the gun for longer grip lengths.



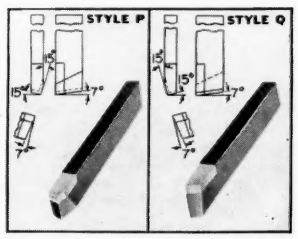
Cherry blind rivets are designed to speed up production by making it easier to handle riveting jobs in difficult places where there is access to only one side of the work. They are headed-up by a hand gun or power gun operated from one side only. No buckling bar is needed.

Mention R238 When Writing or Using Reader Service

NEW STYLES OF STELLITE-TIPPED TOOLS

Haynes Stellite Co.,
Unit of Union Carbide and Carbon Corp., Kokomo, Ind.

Two new styles of tipped tools especially designed for machining steel have been announced by this company. The new tools, designated as Style P and Q, consist of a cutting tip of Stellite 98M2 cobalt-base alloy brazed or butt-welded to a tough steel shank, with proper clearance and lead angles ground for turning steel. These and other Stellite tipped tools are recommended for applications employing tools that have a large cross section or tools that are bent or offset, or for tool holders which make the use of solid tool bits impractical. In addition to use in turning, boring, and facing operations, these tipped tools are also used for various types of forming and grooving operations. Style P is a right-hand tool; Q a left-hand tool.



Mention R239 When Writing or Using Reader Service

More New Products on Pages **14, 15** *and* **18**

R. S. Archer Joins Climax As Assistant to Vice-President

ROBERT S. ARCHER, a past president of the American Society for Metals and for the past ten years chief metallurgist of the Chicago District, Republic Steel Corp., has joined the Climax Molybdenum Co. as metallurgical assistant to the vice-president.

R. S. Archer

A graduate of the university of Michigan with a Master of Science degree, Mr. Archer was connected during the last war with the metallurgical laboratory of the Bureau of Aircraft Production in Detroit. In 1919 he joined the Aluminum Co. of America in Cleveland, becoming head of the Cleveland Section of the Research Bureau before he left in 1930. It was during this period that he collaborated with Zay Jeffries in the preparation of the well-known book, "The Science of Metals."

From 1930 to 1934 Mr. Archer was director of metallurgy for the A. O. Smith Corp. of Milwaukee; he has been with Republic Steel from 1934 to the present.

IMPORTANT COMING EVENTS

May 17-18—Society of Automotive Engineers. National Diesel Fuels and Lubricants Meeting, Hotel Knickerbocker, Chicago.

May 17-18—National Metal Trades Association. Annual Meeting, Biltmore Hotel, New York.

May 18-20—Society for Experimental Stress Analysis. Spring Meeting, including a Symposium on Residual Stresses, Their Measurement, and Effects. Hotel Statler, Boston.

May 22-24—American Gear Manufacturers Association. Spring Meeting, Westchester Country Club, Rye, N. Y.

May 25—American Iron and Steel Institute. Fifty-Third General Meeting, Waldorf-Astoria Hotel, New York.

May 25-26—American Machine Tool Distributors' Association. War Conference, French Lick Springs Hotel, French Lick, Ind.

June 5-7—Society of Automotive Engineers. National War Material Meeting, Detroit, Mich.

June 8—American Management Association. Annual Meeting, Hotel Pennsylvania, New York City.

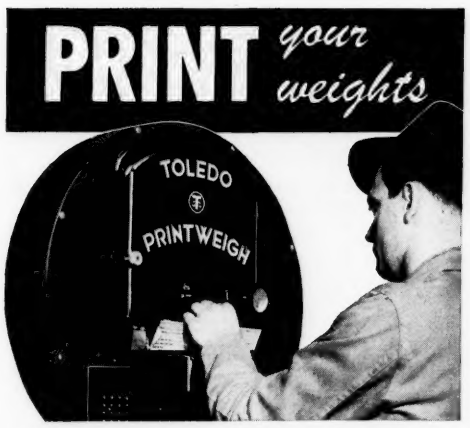
June 8-9—Midwest Industrial Gas Sales Council, Peoria, Ill.

June 12-14—American Electroplaters Society. Annual Meeting, Hotel Cleveland, Cleveland, Ohio.

June 19-22—American Society of Mechanical Engineers. Semi-Annual Meeting, William Penn Hotel, Pittsburgh, Pa.

June 26-30—American Society for Testing Materials. Annual Meeting, Waldorf-Astoria Hotel, New York City.

Oct. 16-20—National Metal Congress and War Conference Display. Sponsored by American Society for Metals, Hotel Statler and Public Auditorium, Cleveland.



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Toledo Scale Company, Toledo, Ohio.

TOLEDO PRINTWEIGH SCALES

Mention R240 When Writing or Using Reader Service

Metal Literature Review—*Continued*

23. INDUSTRIAL USES *(cont.)*

23-121. A Stove Builder Makes Bombs. Gerald Eldridge Stedman. *Modern Machine Shop*, v. 16, April '44, pp. 124-130, 132, 134.

American Stove Co. converts floor spare, porcelaining ovens, pickling facilities and other equipment to the fabrication of 500-lb. general purpose bombs.

23-122. Anti-Friction Bearing Selection for Varying Kenneth N. Mills. *Product Engineer-***Load Conditions.** *ing*, v. 15, April '44, pp. 250-252.

Engineering computations that enable better selection of anti-friction bearings for machines in which loads vary are exemplified with a hoisting machine for removing pipe from an oil well. The general considerations in bearing selection are outlined.

23-123. Man-Hours Reduced 48% by Better Jigs and Fixtures. *Tool Engineer*, v. 13, April '44, pp. 77-83.

Combining limited metal-working experience with keen understanding of production factors, a leading tire manufacturer has applied common-sense tooling ideas to building Bofors anti-aircraft guns. Practical methods described here may be helpful in other fields.

23-124. Magnesium in Aircraft. J. C. Mathes. *Automotive Industries*, v. 90, April 1, '44, pp. 31, 67-68.

Stress corrosion, riveting practice, arc welding practice, service experience, inspection of arc welded joints, primary structures.

23-125. Metal Bellows. G. Eldridge Stedman. *Steel*, v. 114, April 3, '44, pp. 116-118, 160, 162.

Unusual metal working operations in their manufacture.

23-126. Mass Production of Fine Pitch Gears. *Iron Age*, v. 153, April 6, '44, pp. 55-56.

By accurately controlling the blank dimensions and the roughing operations on the teeth, it has been found that shaving gives a sufficiently smooth and accurate finish to eliminate the necessity of burnishing. Pitch diameter tolerance on these gun director gears is 0.001 in.

23-127. Mine Readers. Max G. Boehm and C. Wisner. *Die Casting*, v. 2, April, '44, pp. 26, 28-30.

Current necessity for mass production of parts using methods involving minimum man-hours, and the accent on quality and interchangeability of various spare parts in the field has brought die casting into its own, and these techniques will be used in the post-war radio industry.

23-128. Machining Brass for Bearing End Plate. *Die Casting*, v. 2, April '44, pp. 33-34.

The example of machining brass die castings makes it clear that they lend themselves well to parts of high precision even though dimensions as-cast are not commonly as close as can be held on die castings of lower melting point metals.

23-129. Engineered for Machining. John R. Ehrbar. *Die Casting*, v. 2, April '44, pp. 39-42.

Certain economies are generally recognized as inherent advantages of die castings. These include, among others: less machining, fewer parts, faster production and assembly, lower investment in dies and in fabricating and finishing machines.

23-130. Wear-Resisting Materials for Lathe Construction. R. W. Dayton, C. H. Lorig and R. E. Adams. American Society of Mechanical Engineers *Transactions*, v. 66, April '44, pp. 199-204.

It was found, from tests of all the materials now in general use as the bearing surfaces of lathes, that the combination of hardened steel and alloy cast iron was far more wear-resistant than others and was adequately scoring-resistant. A process referred to as "flame refining" was developed for improving the wear resistance of cast iron.

23-131. Wing Tips. *Steel*, v. 114, April 17, '44, pp. 82, 84.

Continuing research in aluminum alloys keeps light metal in fore in aircraft applications. New composite alloy permits reduction of 10,000 lb. in weight of heavy bomber, thereby increasing possible bomb load.

23-132. Kirksite Molds for Plastics. Carrel C. Sachs. *Iron Age*, v. 153, April 20, '44, pp. 71-75.

The results of tests made at Lockheed Aircraft Corp. to determine whether cast zinc alloy molds could be used in place of the much more costly alloy steel molds ordinarily used for plastics. The tests demonstrate that Kirksite can be used successfully for high pressure transfer molds and also for compression molding of laminates, using heated platens. Deep cavities can be hobbed in the zinc alloy provided it is first heated to 350° F.

23-133. Core Recovery Devices Used in South Australian Drilling Practice. C. F. Duffield. *Australasian Mining & Metallurgy Proceedings*, no. 131 & 132, Sept.-Dec. '43, pp. 207-214.

Diamond drill core-barrel, sample tube for percussion drill, sample tube with calyx cutter.

23-134. Ingenious Mechanical Movements. Charles F. Smith. *Machinery*, v. 50, April '44, pp. 164-165.

Dial transfer mechanism for use in a chain making machine. Function of the mechanism consists of picking up a piece of work and transferring it to a specified position.

23-135. Cast Iron for Pressure Equipment. E. S. Clark. *Metals & Alloys*, v. 19, April '44, pp. 864-868.

Because of its economy, machinability, and design flexibility, design engineers in the past have frequently specified cast iron for cylinders, valves, fittings, etc., required to hold liquids or gas under pressure, but have traditionally limited such applications to low-pressure equipment not involving close fits. In recent years the applicability of gray iron pressure castings has been considerably extended by the development of high-duty irons (of which Meehanite, discussed here, is a leading example), whose structures make them more leak-resistant and warp-resistant than old-time cast iron.

23-136. Types of Belt Construction. Fred L. Hooper. *Industrial Heating*, v. 11, April '44, pp. 571-572, 574, 576.

Woven wire conveyor belts for industrial applications.

23-137. Industrial Equipment. *Steel*, v. 114, April 24, '44, p. 116.

Washing machine, electrode holder, low-high temperature testing chamber, spot welding control, countersink cutters.

23-138. Tool Steel Tubing Applications. George Bissett. *Tool & Die Journal*, v. 10, April '44, pp. 91-95.

Intense competition expected to arise in the approaching post-war period will provide the greatest impetus in the use of tool steel tubing. Short cuts that aim toward getting products on the market ahead of competition will be the order of the day.

24. DESIGN

24-20. Redesigned Bearing Separators Save Weight, Critical Materials, Manhours. *Product Engineering*, v. 15, April '44, pp.237-240.

Important savings made in gun mount separators through redesign. Stamped steel replaced by cast bronze.

24-21. High Performance Fighters. Kurt Tank. *Automotive Industries*, v. 90, April 1, '44, pp. 22-23, 56, 58.

Design problems at stratospheric altitudes discussed in article by German aeronautical engineer and designer of Fockewulf FW 190 fighter.

24-22. Design for Finishing. G. C. Close. *Industrial Finishing*, v. 20, March '44, pp. 68, 70, 72, 74, 78, 80.

Plea for closer cooperation between design engineers and finish engineers. There is more to correct design than mechanical perfection and the ability to withstand certain precalculated stress loads. Any part, no matter how mechanically perfect, will maintain such perfection only as long as the material from which it is fabricated maintains its original physical and chemical characteristics.

24-23. High-Pressure Pipe-Line Research. F. W. Laverty and F. M. McNall. American Society of Mechanical Engineers *Transactions*, v. 66, April '44, pp. 215-219.

Derivation of an empirical equation containing all of the design variables, to which the methods of the differential calculus may be applied to yield a general series of expressions for the most economical design of any pipe line. 7 ref.

25. MISCELLANEOUS

25-83. America at War. *Automobile Engineer*, v. 34, March '44, pp. 111-114.

The situation regarding the available labor force, ferrous and non-ferrous metals, machine tools and rubber is discussed.

25-84. Standardization of Aircraft Tubing. John W. Offutt and David T. Marvel. *Steel Processing*, v. 30, March '44, pp. 159-161.

Recommendations for standardization of sizes of tubing.

25-85. China's Metal Industries at War. *Metals & Alloys*, v. 19, March '44, pp. 600-603.

Pictorial study of operations of China's war plants.

25-86. "Our Business Is Improving." Francis Sill Wickware. *Scientific American*, v. 170, April '44, pp. 169-170, 172.

Research facilities are made available for small business through the activities of the Armour foundation. Without huge investments, industries that cannot otherwise afford research laboratories are placed on the same basis as big business.

25-87. Tool Steel Coding. *Iron Age*, v. 153, March 30, '44, pp. 36-40.

By substituting for proprietary names a mark and number code based on chemical analysis of the tool steels, the Consolidated Vultee Aircraft Corp. has been successful in increasing cutting tool efficiency and improving tool life. Details of this system outlined.

25-88. Materials Standardization. S. B. Ashkinazy. *Mechanical Engineering*, v. 66, April '44, pp. 259-263.

The material standards manual; selection, forms, and types of material, purchase information. Standard full widths and lengths, chemical composition, physical and mechanical properties, bend radii, heat treatment. Material sizes, dimensional tolerances. Product engineer has final authority in use of standard materials; standards engineer advises on use of non-standard material. Advantages of standardization. 19 ref.

25-89. Puts Out Fire Automatically with No Mess. *Industrial Finishing*, v. 20, April '44, pp. 52, 54, 59.

Automatic fire extinguisher system protects stored inflammable liquids from destruction by fire; discovers fire, sounds alarm, shuts fire doors, closes ventilating louvers, stops fans, and discharges carbon dioxide which quickly reduces oxygen content of room air to a point where fire cannot burn—and no mess to clean up.

25-90. After-Glow Technique of Template Reproduction. Thomas Miles. *Product Engineering*, v. 15, April '44, pp. 276-278.

There are now several template reproduction methods that utilize the glow from phosphorescent materials that have been subjected to X-rays. The latest and best known of these methods are discussed and evaluated.

25-91. Efficient Handling. *Steel*, v. 114, April 3, '44, pp. 114-115, 164.

Mechanized handling slashes cost.

25-92. Some Problems in Organizing Industrial Research. W. M. Peirce. *Metals Technology*, v. 11, April '44, Tech. Pub. 1726, 16 pp.

Some of the factors which seem vital in the primary conception of the function of research, in the internal structure of the research department, in the control of research, and in the reporting of research. There is no one best and unchangeable pattern for organizing a research department. Organizations are structures built of individuals and an organization chart is only the post factum blueprint of a structure built on the job from the best material which we can secure.

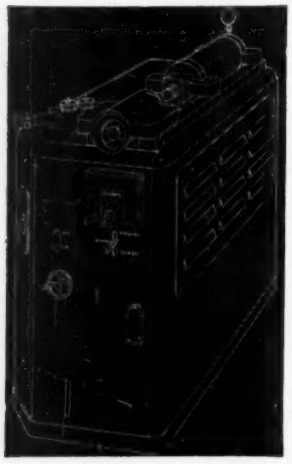
(Continued on page 19)

NEW PRODUCTS IN REVIEW

COMBINATION EXTRUSION MACHINE

Moslo Machinery Co., 2443 Prospect Ave., Cleveland, Ohio.

Designed to aid laboratory and experimental work in a wide range of extrusion processes, an unusual combination machine is announced by this company. New design combines a laboratory type 12-ton hydraulic extrusion press and an automatic wire feed unit in one machine occupying only 2 x 4 ft. of floor space. Extreme simplicity of operation, convenience of control and unusually neat modern lines feature this specialty, of welded steel construction.



While designed primarily for extrusion of welding rods, the press may be had with dies for extruding powdered metals, carbon and certain plastics. The combination unit is so designed that the press can be sold without the wire feeding unit. Pressure of 10,000 psi. on the material is achieved, which, combined with the automatic wire feeding, makes the machine suitable for small scale production of welding electrodes.

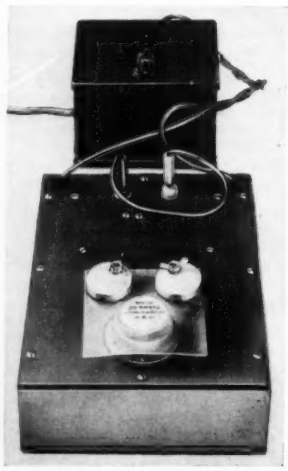
The unit is so built that it ships complete, including an extrusion die head, ready to set on a laboratory or factory floor, connect to a power line and go into action. Hydraulic and electrical controls are located in a panel at the operating end, with a pressure gage, reading in direct pressure on the extrusion cylinder, always in view of the operator. Machine is said to be in production, with 12-week deliveries on proper priorities.

Mention R241 When Writing or Using Reader Service

ELECTROLYTIC MARKING METHOD

Acme Marking Equipment Co.,
2222 W. Fort St., Detroit 16, Mich.

A new electrolytic method of marking metal, yielding 1200 to 1500 impressions per hour, is announced by this company. Called the Met-L-Etch, it consists of a compact unit 2x6x9 in. with a 110-volt a.c. transformer. With this equipment, names, numbers, trademarks, inspection symbols and other data are quickly and permanently etched on smooth metal surfaces without the use of acid. The part to be marked does not need any special preparation, nor does it require cleaning or neutralizing after being marked.



In operation, a drop of conductive solution, good for 500 impressions, is applied to a silver pad on which rests a celluloid stencil engraved with the mark to be etched. The part to be marked is placed on the stencil in contact with adjustable guide posts. Current is turned on by a slight pressure, one second being sufficient to produce a permanent mark that cannot be eradicated without removing the surface of the part itself.

Two models are offered, one for marking flat surfaces, the other for marking the periphery of round parts.

Mention R242 When Writing or Using Reader Service

LOG WASHERS FOR MINE ORE

The Webb Corporation, Webb City, Mo.

Log Washers are one of the oldest known types of machines for use in the removal of soluble clays, over-burden and surface dirt from the general run of mine ore. The washer is essentially a preparatory machine, preparing the ore for further concentration by the removal of foreign material.

The Log Washer consists primarily of a pair of revolving logs to which are attached scrubbing blades. The entire assembly is mounted in a steel tank set at an inclined angle. Rough mine dirt is fed in at the lower end. As the blades revolve the scouring action of the blades cuts through the material in such manner as to loosen the clay and fine particles which are carried off in suspension with the overflow water. The ore bearing rock is conveyed upward by the spiral screw action of the blades and is discharged at the upper end of the washer.

A series of water sprays located between the logs, combined with that introduced with the feed material, produces a washing action in combination with the revolving blades said to be found in no machine of equal cost.

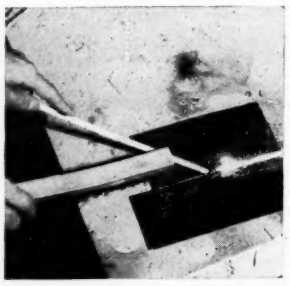
This machine can be used on any type of material for the removal of foreign matter so long as this matter is soluble or capable of being carried in suspension by the wash water. In cases where fine particles of ore are found in the rough mine dirt, this fine ore may be recovered from the overflow by means of settling tanks or classifiers.

Mention R243 When Writing or Using Reader Service

GALVALLOY—COATING AND SOLDER

Metalloy Products Co.,
1351 E. 17th St., Los Angeles 54, Calif.

Bonding to practically any metal surface without the use of flux, Galvalloy provides a corrosion resistant coating and can also be used as a solder for aluminum and other non-ferrous alloys.



In aircraft and foundry, Galvalloy is offered for filling in blowholes or defects in aluminum castings, for soldering aluminum alloys, repairing damaged die plates, and sealing seams on aluminum alloy. In shipyards, one of the most important uses is covering welded seams on galvanized materials, on which the welding process has burned off the galvanizing.

After cleaning metal surfaces, Galvalloy is heated to between 625 and 675° F. and applied with a brass brush. Galvalloy is available in bar form.

Mention R244 When Writing or Using Reader Service

OIL RECLAIMER

Youngstown Miller Co., Sandusky, O.

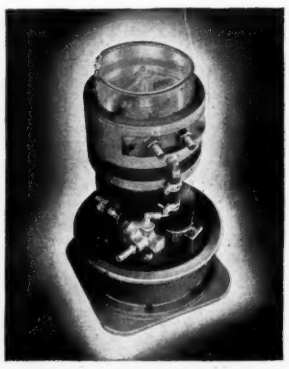
A new line of "Robot" oil refiners, designed to clean lubricating oil with continuous and automatic operation is announced by this company. This machine, which is said to add new convenience and economy to the widely used YM process of cleaning oil, utilizes common refinery earths available on the open market. It is capable of removing fuel dilution, acids, solid and colloidal carbon, dirt and similar matter; also, it can restore oil emulsified by water. When piston varnish and sludge deposits are present, the manufacturers offer a guarantee on removing them and preventing recurrence.

Mention R245 When Writing or Using Reader Service

NEW CURRENT INTERRUPTOR FOR INDUCTIVE DC CIRCUITS

Sciaky Bros., 4915 W. 67th St., Chicago 38, Ill.

The Dynatrol, a new device for the high speed, arcless current interruption of inductive d. c. circuits has been announced by this company. It is designed to replace magnetic contactors formerly used on resistance welders of the electro-magnetic stored energy type. While these contactors proved effective, the continuous arcing required periodical maintenance and replacement and resulted in some power loss.



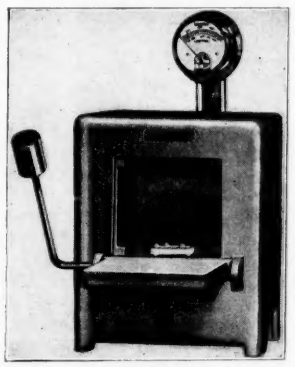
The Dynatrol interrupts the charging current without arc and thus reduces maintenance, increases the efficiency of the system and, because of shorter charging time, results in 20% greater operating speed. It is essentially a high speed, single pole interruptor, the contact points of which are shunted by a bank of capacitors. The Dynatrol is available on all Sciaky stored energy welders up to and including 50 kw. Descriptive booklet is available.

Mention R246 When Writing or Using Reader Service

TEMCO ELECTRIC FURNACE

Thermo Electric Mfg. Co.,
497 W. Locust St., Dubuque, Iowa.

Used extensively for heat treating small parts, tools, dies, gears, etc., for testing and development work, and for various industrial laboratory uses, this Temco electric furnace operates continuously at temperatures up to 1500° F. and intermittently up to 1850° F. Heat selection in models GR and GRP—the furnace illustrated—is through a heavy-duty rheostat with three ranges: Low, 70 to 400° F.; medium, 400 to 800° F.; and high, 800 to 1500° F. Adjustable contact bands permit precise selection in any of the three ranges.



A fourth switch position, having no series resistance, allows rapid heating of the furnace to maximum temperature in but 30 min. Model GRP has an indicating pyrometer which is calibrated in both Centigrade and Fahrenheit scales; calibration is by 50° increments up to 2000° F. and 1100° C.

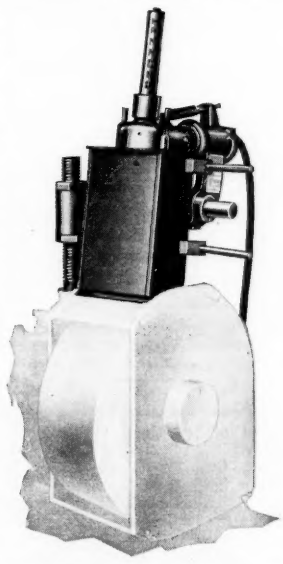
Heating chamber is 4 in. wide, 3¾ in. high and 3¾ in. deep. It easily accommodates small tools and parts or six No. 0 tall form crucibles. Outside dimensions are 8¾ in. wide, 13½ in. high and 10 in. deep. Highest quality Nichrome wire is used in the heating elements and these are completely embedded in the muffle, reducing to a minimum the oxidation and chemical deterioration said to be common with exposed windings.

Meniton R247 When Writing or Using Reader Service

AUTO-DOPER

Hammond Machinery Builders, Inc.,
1647 Douglas Ave., Kalamazoo, Mich.

A new automatic air-operated cylindrical and rectangular composition applicator for use on any type of polishing and buffing machine, is announced by this company. Known as the "auto-doper", it is designed and constructed so that it can be used for either cylindrical or rectangular bars by merely changing the composition housing for the type of bar required. It is operated by compressed air and the frequency of operation is controlled by an air valve operated from a cam, electrical timer or foot valve as the requirement may indicate. Further claims made are more uniform application of composition, thus improving quality of work, an economy in composition costs. It is also said that because of the simplicity of construction and operation by compressed air, only one moving part is required. Air operation does not require special gear motors or solenoids; thus electrical characteristics are not a problem in plants using the air-operated auto-doper. Simplicity of air-operating construction with easy screw adjustment permits rapid change of frequency of application when desired.



Mention R248 When Writing or Using Reader Service

ETCHER AND DEMAGNETIZER

Ideal Commutator Dresser Co.,
1929 Park Ave., Sycamore, Ill.

New tool that is ready for instant use as either an etcher or demagnetizer, enclosed in an attractive case with removable hinged cover, has been developed by this company. To etch, small tools and parts are simply placed on the work-plate and switch is turned to proper heat. A ground clamp is provided for etching parts too large for the work-plate. Fourteen heats are provided, giving a wide range for marking all iron, steel and their alloys from small delicate parts up to large smooth castings. To demagnetize, it is only necessary to turn the switch on to either No. 1 or No. 2 position and proceed as with ordinary demagnetizer.

Mention R249 When Writing or Using Reader Service

More New Products on Pages 14, 15 and 16.

Metal Literature Review—*Continued*

25. MISCELLANEOUS (*cont.*)

25-93. Abrasive Belts Recoated. J. S. Siefen. *Iron Age*, v. 153, April 6, '44, pp. 58-59.
Abrasive belts when worn out recoated by brushing on one coat of "Brushing Nuglu" which is a mixture of a liquid cold glue and aluminum oxide grain.

25-94. What's Ahead for the Metalworking Industry. *Steel*, v. 114, April 17, '44, pp. 67-70.
Time factor for reconversion to peacetime production will vary among plants as to size as well as among segments of the industry. Maintenance of present employment and production levels in postwar period expected by high percentage of manufacturers.

25-95. Small Metalworking Plant Preparing Now for Transition to Peacetime Activities. Glenn L. Bybee. *Steel*, v. 114, April 17, '44, pp. 76-77.
Peacetime addition to production facilities will be unemployment stop-gap. Fund being set up to meet future needs. Prewar customer contacts kept alive. Expect to make changes in materials and machines.

25-96. Rivet Handling Revolutionized. *Steel*, v. 114, April 17, '44, pp. 98-99.
Rivets packed in cellophane. The bag is stamped with the rivet's size, and is packed automatically. The worker is saved time in finding the size needed and few rivets are dropped.

25-97. Industrial Study Analyzes Postwar Manufacturing Opportunities. *Western Metals*, v. 2, April '44, p. 7.
Iron and steel products expansion outlined.

25-98. Watertown Arsenal 1816-1944. *The Houghton Line*, vol. 12, no. 6, April-May '44, pp. 37-48.
Fifth in a series of articles describing the arsenals of America. History, facilities, procedure for making gun tubes.

25-99. Which Small Motor to Use? C. T. Button. *Machine Design*, v. 16, April '44, pp. 125-128.
Principles peculiar to different types of motors, advantages and disadvantages; future developments.

25-100. Choosing the Right Material. H. W. Gillett. *Machine Design*, v. 16, April '44, pp. 172-174.
How to insure quality and freedom from scatter more important than how to make chemical and mechanical post-mortems after service failure has occurred. 6 ref.

25-101. Production Schedules Met by Systematic Motor Maintenance. D. W. McGill and W. W. McCullough. *Machinery*, v. 50, April '44, pp. 148-153.
Comprehensive survey of causes of motor failure, together with definite instructions on the steps to be taken to avoid them. Particular attention to bearings and lubrication.

25-102. Will it Pay to Clean Water Lines? B. A. Noel. *Blast Furnace & Steel Plant*, v. 32, April, '44, pp. 455-456.
The problems to be solved are: What is the condition of the interior of the pipe lines in this plant in terms of carrying capacity? What tests need be performed to determine their condition? Would it pay to have the lines cleaned?

25-103. Production Problems in Small Parts Manufacture. C. P. Roberts, and E. B. Neil. *Tool & Die Journal*, v. 10, April '44, pp. 87-90, 110.
Improving the finish by improving the reamer, effect of smooth surface under plating on wearing qualities, tips on redesigning to permit faster production.

25-104. The Hazards of Carbon Monoxide: IV. Frank S. Rossiter. *Industrial Heating*, v. 11, April '44, pp. 552, 554, 556, 612.
Hazards from carbon monoxide in industry, commercial establishments and homes. Sources of the gas, its effects on the human system when absorbed, methods for the resuscitation of gassed persons, and methods for testing for the presence of carbon monoxide in the atmosphere are also described.

26. STATISTICS

26-48. Domestic Metal Supply Ample to Meet Needs. *Metals*, v. 14, March '44, pp. 17-20.
MRC stockpiles of lead and zinc grow, but WPB urges maximum output as safeguard against contingencies.

26-49. Quicksilver. Gordon I. Gould. *Mining World*, v. 6, March '44, pp. 23-24.
The domestic quicksilver industry has been disclosed in figures recently made public as having risen to meet the wartime emergency quickly and adequately.

26-50. Role of the Heavy Metals in the Postwar Economy. John D. Sullivan. *Mining World*, v. 6, March '44, pp. 32, 34.
Postwar forecast for steel, copper, zinc, lead, and tin.

26-51. Role of Heavy Metals in Postwar Economy. John D. Sullivan. *Mining Congress Journal*, v. 30, March '44, pp. 29-34.
Firm postwar position for heavy metals is indicated by past experience, future consumer demands, and available supplies. Technical advances of war period to be reflected in our postwar economy.

26-52. Control of Mineral Supplies to Preserve Peace—a Symposium. *Mining and Metallurgy*, v. 25, April '44, pp. 199-207.
Problems of Mineral Sanctions, C. K. Leith. Postwar Control of Axis Al and Mg Industries, Philip D. Wilson. Mineral Sanctions, War and Peace, H. Foster Bain. Canadian Views on Postwar Situation, George C. Bateman. Petroleum as an Instrument for Peace, W. B. Heroy. Role of Steel in Mineral Sanctions, C. K. Leith. Mineral Control—Wise or Unwise?, P. D. Merica. Position of Iron and Steel Industries, Walter S. Tower.

26-53. Survey of Copper, Lead, and Zinc. *Mining Journal*, v. 27, April 15, '44, pp. 3-4.
A comprehensive outline of the situation in the copper, lead, and the zinc industries, together with a resumé of the industries' prospects for the coming year.

27. NEW BOOKS

27-33. Mechanical Properties of Metals & Alloys. Bureau of Standards Circular 447, 1943, 481 pages. Sup't of Documents, Washington, D. C., $1.50.

27-34. A Steel Man in India. John L. Keenan. Duell, New York. $2.50.

27-35. Polishing and Lapping. H. L. Ness. The Author, 3332 Nicollet Ave., Minneapolis 8, Minn. $7.50.

27-36. Year Book of the American Iron and Steel Institute 1943. 367 pp., *American Iron and Steel Institute*, 350 Fifth Ave., New York 1, N. Y.
Proceedings of 52nd General Meeting. Address of the President, W. S. Tower; addresses by Vice-Admiral S. M. Robinson and Major General L. H. Campbell, Jr. Reports on The Expansion Program and General Production Problems, Steelmaking Practices, Conservation of Critical Materials, Industrial Relations.

27-37. Recommended Practices for the Sand Casting of Non-Ferrous Alloys. 159 pp., illus. American Foundrymen's Association, 222 West Adams St., Chicago 6, Ill. $3.00.
Compiled by the Recommended Practices Committee, Brass and Bronze Division, and Committee on Sand Castings, Aluminum and Magnesium Division, American Foundrymen's Association. Covers molding, melting and pouring, finishing, heat treatment, defects—their causes and remedies—properties and applications of various copper-base, aluminum-base and magnesium-base alloys.

27-38. Alloy Cast Irons Handbook. 2nd ed., 282 pp., illus., American Foundrymen's Association, 222 West Adams St., Chicago 6, Ill. $3.25.
Reviewed and revised by Alloy Cast Irons Committee, Gray Iron Division, A.F.A. Metallurgical principles; effect of alloys on physical and mechanical properties; ladle inoculants; white and chilled alloy cast iron; heat treatment; foundry practice; specific applications.

27-39. Chemical Machinery. E. Raymond Reigel. 579 pp., 400 illus. Reinhold Publishing Co., New York. $5.00.
Presents details of construction, operating technique, capacity, and, where possible, price of all leading types of process equipment.

27-40. The Oxy-Acetylene Handbook. 600 pp., The Linde Air Products Co., 50 East 42nd St., New York, N. Y. $1.50.
Covers the entire range of the oxy-acetylene process, giving clear, easy-to-follow instructions for handling all the common commercial metals, together with simple explanations of the fundamental principles of the various methods of depositing and controlling molten metal. Explains operating principles of oxy-acetylene equipment and instructions for its care and maintenance. A how-to-do-it book.

27-41. Essentials of Precision Inspection. Wesley Mollard. McGraw-Hill Whittlesey Practical Manual, 207 pp., illus., McGraw-Hill Book Co., 330 W. 42nd St., New York 18. $3.00.
Tells the beginner everything about the inspector's job he should know before taking up work in this field, from the purpose, use, and care of instruments and precision tools, to procedure, terms, materials, and efficient methods of work. Fifty-four practical problems cover every phase of inspection likely to be encountered today.

Four Young Speakers Make Debut at Dayton

Reported by Stewart M. DePoy
Metallurgist, Delco Products Div., G.M.C.

Dayton Chapter—An innovation in technical meetings was presented in April when the program was made up entirely of young speakers from among the chapter members. These men, who for the most part were making their first appearance on a speaker's rostrum, nevertheless presented their papers like veterans.

The first speaker was J. C. McGee, metallurgist, Materiel Command, Army Air Forces, Wright Field. His talk on "Micro-Hardness Determination as an Aid in Identification" was an exposition of the Eberbach micro-hardness test, demonstrated by lantern slides.

A. O. Fink, chemical engineer, Frigidaire Division, General Motors Corp., described "A Method for Recording Magnaflux Indications in Three Dimensions." After trying many other possibilities, it was found that a slow setting transparent lacquer did the job very well. In this manner it was possible to set up definite visible standards to guide the operators.

Electropolishing was the subject of the talk by William McCrabb, assistant chief metallurgist, Inland Mfg. Division, G.M.C., who gave a thorough explanation of the equipment used by his firm. He pointed out the simplicity of the set-up, the splendid results, and the time saving advantage of the method.

The final speaker, T. E. Hamilton, metallographer, Delco Products Division, G.M.C., gave a short resume of the extensive work being done at Delco on refrigeration of high speed steel cutting tools. He revealed definite experimental results showing the increase in hardness and the increase in productivity of the tools, the latter averaging about 40%. Lantern slides of microstructures gave an insight into the structures obtained by sub-zero treatment.

This experiment proved such a success that the Executive Committee has decided to make this an annual affair. This type of meeting not only reveals a wealth of good speakers and subjects in the chapter's own membership, but also gives young technicians a chance to show their mettle.

Materials Index

To the Metal Literature Survey

THE FOLLOWING tabulation classifies the articles annotated in the preceding pages according to the metal or alloy concerned. The articles are designated by section and number. The section number appears in bold face type and the number of the article in light face.

General Ferrous

1-41-45-46-47-48-49-50-51; **6**-12; **7**-45; **8**-31; **12**-86-96; **14**-120-123; **16**-50-51-56; **17**-17; **18**-88; **19**-89; **25**-97-102; **26**-50-52; **27**-34-36.

Cast Iron

2-18; **3**-61-70; **10**-18-19; **12**-94; **14**-114-116-121-125-132-133-139-140-141-152-153-155-156-159-163; **18**-81-89; **23**-130-135; **27**-38.

Cast Steel

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Wrought Carbon Steel

3-56-59; **12**-88-97; **18**-75-76-79; **19**-73-74-75-84; **21**-41-46; **22**-144-148-153-156; **23**-109-119-130; **24**-20.

Alloy Steel

3-69; **10**-19; **14**-161; **18**-76-78-79-82-83-85-86; **19**-94; **22**-154-155.

Stainless and Heat Resisting Steel

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Tool Steels and Carbides

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General Non-Ferrous

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Copper, Brass and Bronze

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Nickel, Monel and Nickel Alloys

8-35.

Lead and Lead Alloys

1-40; **26**-48-53.

Tin and Tin Alloys

8-32.

Zinc and Zinc Alloys

1-43-52; **6**-10; **7**-41; **9**-4; **23**-132; **26**-48-53.

Miscellaneous and Minor Metals

1-42; **2**-16-21; **8**-34-37; **9**-3-6; **10**-15; **26**-49.

Potential Uses of Electronics In Metal Field Are Impressive

St. Louis Chapter—The program for the March meeting consisted of an interesting introduction to the world of electronics and its application in industry, and was delivered by C. W. Schemm, application engineer of the General Electric Co. Speaking on "Industrial Electronics," Mr. Schemm, a past chairman of the chapter, outlined the many valuable uses of electronics and electronics equipment in a broad field of industrial processes.

The principle of electronics has been applied to such things as manufacturing bags, printing of colored pictures, control of resistance welding machines, instantaneous detection of mercury vapor, control and recording of furnace temperatures and many other operations.

Everyone present was impressed with the potential uses of electronics in the metallurgical field. This was evident in the length of the discussion period which followed Mr. Schemm's talk—a near-record for the question period. The meeting was wound up with the usual refreshments and discussions so typical of the Chapter's monthly gatherings.

MANUFACTURERS' CATALOGS IN REVIEW

X-ray and Radium Protection

Bar-Ray Products, Inc., 209 25th St., Brooklyn, N. Y.

Latest technical literature on X-ray and radium protection, together with lead products catalog, has been issued by this company. Included with this material are the comprehensive data of the U. S. Bureau of Standards on X-ray protection which covers general recommendations, electrical protection, equipment, film storage, and a wealth of other valuable information.

Mention R250 When Writing or Using Reader Service

Pickle Bath Toners

American Chemical Paint Co., Ambler, Pa.

Two new technical service data sheets are available on ACP pickle bath toners No. 1 and 2 (liquid) and on No. 101 and 102 (powdered). These products are described and their use and application detailed.

Mention R251 When Writing or Using Reader Service

Slide and Butterfly Valves

W. S. Rockwell Co., 50 Church St., New York 7, N. Y.

This 24-page catalog No. 406 describes Rockwell slide valves and butterfly valves for the regulation of air, gases, steam, water and other fluids. Many types of valves and applications are pictured.

Mention R252 When Writing or Using Reader Service

Dilatometer

The Bristol Co., Waterbury 91, Conn.

The Bristol-Rockwell dilatometer, model A-134, and its use are described in this 6-page leaflet. A direct-reading dilatometer, it records temperature-dilation changes and temperature-time changes simultaneously in ink during heating and cooling cycles of ferrous and non-ferrous

Mention R253 When Writing or Using Reader Service

Scientific Inspection

Continental Machines, Inc.,
1301 Washington Ave. S., Minneapolis 4, Minn.

"Quality Control" is the title of this new 64-page pocket size handbook on scientific inspection. Dozens of photographs, diagrams, charts and tables make its explanation of scientific inspection interesting and informative. Its use will be of particular value to any plant inspection department seeking new ways to establish quality control over their products.

Mention R254 When Writing or Using Reader Service

Tool Steel Tubing

The Bissett Steel Co., 945 E. 67th St., Cleveland 8, Ohio.

This leaflet shows how tool steel tubing can be used for blanking dies, forming dies, punches, machine tool parts and other tools and parts.

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Tapping Machines

Cleveland Tapping Machine Co.,
1725 Superior Ave., Cleveland, Ohio.

This company has issued two folders on its tapping machines, giving many details of construction and use.

Mention R256 When Writing or Using Reader Service

Industrial Furnaces

The Drever Co., 748 E. Venango St., Philadelphia 34, Pa.

Sixteen-page booklet illustrates many types of industrial furnaces and deals with such subjects as continuous furnace lines, quenches—oil and spray, straightening pressure quench, ammonia dissociator and other topics.

Mention R257 When Writing or Using Reader Service

Blind Riveting

Cherry Rivet Co., 231 Winston St., Los Angeles 13, Calif.

This 36-page manual on Cherry Blind Rivets is unusually complete and profusely illustrated in color sketches, diagrams and tabular material. Manual describes the blind rivet, drilling of the hole, selecting the rivet and pulling head, operation, installation procedure, tools and inspection technique.

Mention R258 When Writing or Using Reader Service

Surface Grinders

H. Leach Machinery Co., 387 Charles St., Providence, R. I.

Twelve-page booklet gives complete details and illustrations of precision surface grinders, in both automatic feed and hand feed types.

Mention R259 When Writing or Using Reader Service

Thermostatic Bi-Metals

Callite Tungsten Corp.,
540 Thirty-ninth St., Union City, N. J.

A new technical bulletin gives information on Calliflex Bi-metal and describes it as a reliable economical material for use as a temperature responsive element. It is available in five types according to temperature requirements —low, medium, special medium, high, and rust-resisting types.

Mention R260 When Writing or Using Reader Service

Mechanical Springs

Associated Spring Corporation Divisions: Wallace Barnes Co., Bristol, Conn.; Barnes-Gibson-Raymond, Detroit 11, Mich.; F. N. Manross & Sons, Bristol, Conn.; William D. Gibson Co., Chicago 14, Ill.; Raymond Mfg. Co., Corry, Pa.; Dunbar Brothers Co., Bristol, Conn.; Wallace Barnes Co., Ltd., Hamilton, Ont.

"Mechanical Springs, Their Engineering and Design" is the title of a 106-page handbook just issued jointly by the divisions of this company. Book presents various charts and formulas upon which the design of all types of mechanical springs is currently based. Material represents the experience, research and knowledge of the combined engineering forces of all divisions. Copies may be obtained through the nearest of the divisions, by engineers and the purchasing department.

Mention R261 When Writing or Using Reader Service

Soluble Cutting Oil

D. A. Stuart Oil Co., Ltd.,
2743 S. Troy St., Chicago 23, Ill.

This 20-page booklet discusses typical problems involved in the selection and application of water-mix oils. Articles include: "By What Yardstick Do You Measure the Ideal Soluble Oil?", "Antiseptics in Soluble Oils" and "Where Can I Use Soluble Oil?" Another helpful article tells how to mix soluble oils for best results. Booklet is liberally illustrated with photographs of machining operations and laboratory tests.

Mention R262 When Writing or Using Reader Service

Electric Heating Units

Watlow Electric Mfg. Co.,
1320 N. 23rd St., St. Louis 6, Mo.

A wide variety of electric heating units are described in detail and illustrated in this 30-page catalog, citing applications in plastic molding machinery, industrial fuel oil preheaters, etc.

Mention R263 When Writing or Using Reader Service

Hard Facing Alloys

Wall-Colmonoy Corp., 720 Fisher Bldg., Detroit 2, Mich.

Eight-page general catalog outlines the hard facing alloys and overlay metals of this company, with many illustrations and typical applications.

Mention R264 When Writing or Using Reader Service

Synthetic Optical Crystals

The Harshaw Chemical Co.,
1945 East 97th St., Cleveland, Ohio.

Sixteen-page booklet describes synthetic optical crystals, their production by a unique method, and their use for infra-red and ultra-violet spectroscopy, infra-red photography and polarizing optics.

Mention R265 When Writing or Using Reader Service

Vapor Degreasing

Phillips Mfg. Co., 3475 Touhy Ave., Chicago 45, Ill.

Twenty-four-page handbook presents scores of questions and answers on vapor degreasing, thus outlining in a practical way the field and scope of this equipment and solvents used.

Mention R266 When Writing or Using Reader Service

Heat Treating and Melting Equipment

Eclipse Fuel Engineering Co., Rockford, Ill.

The complete line of heat treating and melting furnaces, burners and other equipment of this company is described and illustrated in new bulletin "D" just issued.

Mention R267 When Writing or Using Reader Service

Crucible Melting Furnaces

Stroman Furnace & Engineering Co.,
300 W. Adams St., Chicago 6, Ill.

Stationary and manual tilting crucible furnaces for melting brass, bronze, aluminum, copper and other alloys are described and illustrated in this 8-page booklet.

Mention R268 When Writing or Using Reader Service

Refractories and Guns

Basic Refractories, Inc., Cleveland 15, Ohio.

"Gunmix", a new series of refractories designed for rapid emplacement by air stream and water, and a practical, low-cost, pneumatic Gunmix Gun, are described and illustrated in this 4-page leaflet. Gunmix refractories are said to have high refractoriness, rapid coalescence with hot surfaces and ready adherence to vertical walls.

Mention R269 When Writing or Using Reader Service

Hammered Tool Steels

McInnes Steel Co., Corry, Pa.

Eight types of tool steel are described in this leaflet, with suggested applications, analyses, hardening and tempering directions.

Mention R270 When Writing or Using Reader Service

Interrupted Quench In Salt

E. F. Houghton & Co.,
303 W. Lehigh Ave., Philadelphia 33, Pa.

Thirty-two-page booklet, "Production Data," presents several articles from "The Houghton Line," including the use of the interrupted quench in the new salt bath method. Another article deals with the forging and heat treating of 57-mm. gun tubes.

Mention R271 When Writing or Using Reader Service

Production Forge Furnaces

Surface Combustion, Toledo 1, Ohio.

Industrial forge furnaces of two types—(1) the slot forge used for heating the ends only of the stock, and (2) the oven forge or billet heater designed to heat the stock all over—are described and illustrated in this 4-page folder.

Mention R272 When Writing or Using Reader Service

Turret Punch Presses

Wiedemann Machine Co.,
1815 Sedgley Ave., Philadelphia, Pa.

Two booklets describe the turret punch press and gauge tables manufactured by this company. These presses are particularly designed to handle short run and low quantity production piercing of sheets and plates in a fraction of the time and labor required in other methods, it is said.

Mention R273 When Writing or Using Reader Service

Gas Burners and Combustion Equipment

Burdett Mfg. Co., 19 N. Loomis St., Chicago, Ill.

This 112-page catalog presents factual information on infra-red principle gas burners and auxiliary equipment. Containing a wealth of valuable engineering and general reference data, the catalog includes velocity pressures, motor ratings, units of electricity, centigrade and fahrenheit equivalents, wiring diagrams.

Mention R274 When Writing or Using Reader Service

Industrial Combustion Data

Hauck Mfg. Co., 124 Tenth St., Brooklyn, N. Y.

This bound book is a helpful reference for anyone concerned with the selection, installation, operation and maintenance of combustion equipment, either oil or gas, on furnaces, ovens, kilns, retorts and other heat processing equipment. 112 pages packed solid with down-to-earth data on industrial combustion and heat practice. Book avoids complex technical terms and involved theoretical discussions.

Mention R275 When Writing or Using Reader Service

Thermocouple Data Book

Wheelco Instruments Co.,
Harrison & Peoria Sts., Chicago 7, Ill.

A new 36-page edition of the thermocouple data book and catalog describes products, prices and presents recommendations for thermocouple users, with suggested substitutes for restricted materials. Included are temperature conversion tables, millivolt tables, and tables on pipe and wire sizes, decimal equivalents and wire resistances. Instructions are given on checking thermocouples and pyrometers, and on construction of thermocouples.

Mention R276 When Writing or Using Reader Service

Welding and Cutting Equipment

Victor Equipment Co.,
844 Folsom St., San Francisco, Calif.

Beautifully illustrated in color, this 16-page booklet describes the welding and cutting equipment offered by this company. Safety regulators, welding torch nozzles, cutting torches and other equipment are illustrated.

Mention R277 When Writing or Using Reader Service

The REVIEW
THE MONTHLY SURVEY AND DIGEST OF WHAT'S NEW IN METALS

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